

Hydrology Study

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1 HYDROLOGICAL STUDY

1.1 INTRODUCTION

Rajasthan Spinning and Weaving Mills Limited (RSWML), a private limited company incorporated in India, proposes to set up Allain - Duhangan Hydroelectric Project (ADHEP) of 2 x 96 MW (192 MW hydropower generation facility on Allain and Duhangan tributaries of Beas river) in Tehsil Manali, District Kullu, Himachal Pradesh in India. The project is located near village Prini, approximately 3 km SE of Manali town.

RSWML has retained ERM India Pvt. Ltd, New Delhi to undertake detailed Environmental and Social Impact Assessment (ESIA) Study including specialised studies to fulfil the IFC requirements in accordance to the requirements of OP 4.01.

As a part of the ESIA study there is a need to establish a minimum flow downstream on Allain and Duhangan streams for the maintenance of aquatic ecology and existing agricultural production (e.g. small scale irrigation systems). It is in this context this hydrological study has been carried out by ERM. It is important to mention that for viability of the project, RSWML through its other consultants have got hydrological studies carried out in the past.

This study describes watershed of Beas River, catchment of Allain Duhangan streams, water availability in the Allain and Duhangan, potential impact of the project on hydrology and lastly establishes minimum water required downstream for ecological maintenance.

1.2 BEAS RIVER WATERSHED

The watershed of Beas River above Manali covers an area of about 344.09 sq. km and lies in the state of Himachal Pradesh of North India. The altitude ranges from 1900 m to 5932 m above msl (HANUMAN TIBBA) which is representative of a typical high rise Himalayan basin. The watershed experience heavy snowfall covering 80-90 percent of the area during winter and with minimum temperature of the order of -12° C at base station Manali and about 90 percent of the area is snow free during summer. The hydro-meteorological data on routine basis is being observed by Bakra-Beas Management Board (BBMB), Mountaineering Institute and Snow and Avalanche Study Establishment (SASE) for their own purpose. The catchment is divided into 20 elevation zones each of 200m attitude. Thick vegetation lies in the lower altitudes of the watershed while bushes lie in higher altitude.

ADHEP shall be set-up by utilising the perennial flows of the Allain and Duhangan, the snow-fed tributary streams of the Beas. The Allain stream originates from the glacier zone in the Pir Pinjal range at EL 4800 m while the Duhangan stream originates from Chander Tal glacier at EL 5229 m. The catchments lie in Zone-7 (Western Himalayas) of India, which covers Jammu & Kashmir, Punjab, Himachal Pradesh and Uttarakhand. This Zone-7 is located between Latitude 32°07' to 32°21' N and Longitude 77°07' to 77°11' E, mostly bounded by International boundaries – Indo China border in the north and north-east, Indo-Pakistan border in the west and Indo-Nepal border in the east.

The standard followed by HPSEB for the present project to arrive at the snow-fed catchment areas is – permanent snow line at EL 4280m and area below EL 4280m as rainfed catchment. The catchment areas of the two streams are indicated in the following table

Table 1 *Catchment Area of Allain and Duhangan streams*

Stream & Location	Catchment area in km ² .		
	Above snow-line (EL 4280m)	Below Snow-line (EL4280m)	Total
Allain at Barrage site	51.5	77.4	128.9
Allain at Confluence with Beas	51.5	93.2	144.7
Duhangan at Weir Site	36.1	60.1	66.2
Duhangan at confluence with Beas	40.2	51.6	91.8

As per HPSEB standard, catchment area below EL 4280m has been considered as rain-fed for assessing design floods is an over assessment of design flood peaks. Also, considering the paucity of rain and snow precipitation data of desirable quality and quantity, liberal assessment made by RSWML's consultants has been accepted by Central Water Commission (CWC) while according the technical clearance, as the increase in cost is marginal and does not effect the cost benefit appraisal of the project.

No meteorological data is available to assess the snowline in the case of the catchment s for Allain Duhangan project. Hence, the snowline is assumed on the basis of available data for similar projects and locations. Examination of various published reports and documents infers that snowline during severe rainfall storms could be lower than EL 4280m. As in the case of Dul Hasti Hyroelectric Project in the adjacent Chenab basin (which also originates in Pir Pinjal ranges) the estimated snowline is 3675m.

Discharge observations have been made by floats (as per HPSEB guidelines) thrice a day at Aleo gauging station on the Allain from Jan 1973 to May 1995 and at Jagtsukh guaging station on the Duhangan from Jan 1971 to May 1995. Thus, the data availability for stream flow is for a period of 22 years and for 24 years for Allain and Duhangan streams, respectively. Consistency checks have been carried out on the flow data, adopting the standard procedure/practices in

vogue and those recommended in CBI &P guidelines and codes of BIS. The 24-year 10-daily average series obtained (with some regression of flow records to cover 2 more years) were then transferred to the diversion sites on catchment area proportion basis. Based on these field data, 10-daily average flow series computed have been supplied to RSWM's consultant for analysis and power planning.

In absence of precipitation stations in the catchments of Allain and Duhangan, (particularly in the upper reaches) it was not possible to check precipitation-runoff consistency. However, an attempt was made to arrive at an estimate of glacier/snow melt contribution during monsoon season to assess the reasonability of the average annual yields of the project catchments in the region. This estimate has been made based on the mean monsoon yield of Allain-Duhangan catchments and the average observed glacier/snowmelt contribution in Zone-7 (Western Himalayas) as recorded and analysed by CWC. The rainfall-runoff factor is estimated to be around 34% for Allain-Duhangan catchments, which can be considered as reasonable.

As it is planned to utilise combined flows of the two streams, a combined flow sequence was prepared and statistical parameters of the flow sequence and the flows at different dependabilities have been worked out using Weibull distribution. The average, 50% and 90% dependable flows on 10-daily average flow basis at diversion sites worked out are presented in the following table

Table 2 *Dependable Flow Estimates at Diversion Sites (in Cumecs)*

Catchment Diversion Site	Average	50% Dependable year	90% Dependable year
Allain Stream	9.133	5.940	3.028
Duhangan Stream	4.817	2.950	4.301
Combined Flows	13.950	8.871	4.467

Pattern of flows for these years used for further power planning studies is presented below:

Table 3 *Pattern of Combined Flows of Allain & Duhangan Streams in Cumecs (m³/sec)*

Periods	Spell of Flows	Average Year	50% Dependable Year (76-77)	90% Dependable Year (73-74)
Jun	1st 10 days	21.579	18.042	23.185
	2nd 10 days	23.381	18.359	34.266
	3rd 10 days	26.897	17.592	26.566
Jul	1st 10 days	29.124	23.891	31.365
	2nd 10 days	35.008	33.041	26.619
	3rd 10 days	32.146	36.205	21.268
Aug	1st 10 days	32.958	40.278	24.489
	2nd 10 days	30.103	36.689	23.426
	3rd 10 days	26.895	34.997	22.577
Sep	1st 10 days	22.582	32.446	15.339
	2nd 10 days	19.027	28.441	15.120
	3rd 10 days	15.218	20.443	12.203
Oct	1st 10 days	12.561	13.072	8.674
	2nd 10 days	10.629	9.225	7.064
	3rd 10 days	9.213	9.5983	6.968
Monsoon Average		23.147	24.863	19.883

Periods	Spell of Flows	Average Year	50% Dependable Year (76-77)	90% Dependable Year (73-74)
Nov	1st 10 days	8.095	10.469	5.686
	2nd 10 days	7.265	8.851	5.481
	3rd 10 days	6.617	8.434	5.284
Dec	1st 10 days	5.980	8.376	4.912
	2nd 10 days	5.508	6.204	5.033
	3rd 10 days	5.191	5.538	4.625
Jan	1st 10 days	5.052	5.577	4.206
	2nd 10 days	4.935	5.229	3.283
	3rd 10 days	4.813	4.506	3.377
Feb	1st 10 days	4.688	4.234	3.356
	2nd 10 days	4.587	4.158	3.172
	3rd 8 days	4.654	4.248	4.121
Mar	1st 10 days	4.764	3.908	3.065
	2nd 10 days	5.093	4.224	3.506
	3rd 10 days	5.561	4.635	4.028
Apr	1st 10 days	6.476	4.263	4.618
	2nd 10 days	7.887	4.173	5.575
	3rd 10 days	10.029	5.332	6.852
May	1st 10 days	13.420	6.341	8.408
	2nd 10 days	15.456	8.000	7.302
	3rd 10 days	18.818	13.395	5.958
Non-Monsoon Average		7.421	6.229	4.850
Annual Average		14.008	14.040	11.152

1.4.1 *Comparison of seasonal flows of streams in the Project Region*

Stream flow data of hydro-electric projects in the region have been obtained and processed for comparing the trend followed by the average 10 daily flows for the project catchments with those of others. Corresponding values for monsoon, non-monsoon and annual average run-offs of the streams of these projects have been compared with that for Allain Duhangan streams.

Table 4: *Comparison of Seasonal Flows of Streams within Beas Catchment*

Sl #	Project	Catchment Area (km ²)			Mean Runoff (mm)		
		Rainfed	Snowfed	Total	Monsoon 153 days)	Non monsoon (212 days)	Annual (365 days)
1	Allain	77.4	51.5	128.9	1504.0	718.0	2222.0
2	Duhangan	30.1	36.1	66.2	1646.0	654.0	2300.0
3	Allain & Duhangan	107.5	87.6	195.1	1552.0	696.0	2248.0
4	Malana, weir site	102.3	76.2	178.5	1652.0	658.0	2310.0
5	Malana, Chauki site	112.3	76.2	188.5	1598.0	686.0	2284.0
6	Parbati, Pulga dam	1840.	971.0	1151.0	1287.0	331.0	1618.0
7	Jigrai	21.0	21.0	42.0	1142.0	459.0	1601.0
8	Harla & Manihar	24.5	9.5	34.0	3788.0	1790.0	5578.0
9	Beas at Thalout – Larji dam site	3531.0	1394.0	4925.0	1109.0	410.0	1519.0
10	Sainj at Talara	302.4	417.6	720.0	1090.0	467.0	1557.0
11	Fozal	108.5	20.5	129.0	1162.0	762.0	1924.0
12	Jiwa	54.0	126.0	180.0	1267.0	501.0	1768.0

Comparison of the seasonal flows reveal that all other catchments follow similar trend, except in the case of Hurla-Manihar catchment. This can be considered as an exception, since the catchment area for Hurla-Manihar is very small and the

average runoff of 5578 mm considered seems to be out of tune with annual rainfall normals in the region.

1.5 MINIMUM WATER FLOW TO BE MAINTAINED DOWNSTREAM DURING OPERATION PHASE OF THE PROJECT

1.5.1 Flow Available

The average inflow observed in the past at diversion sites indicates a variation of flows from 1.54 to 21.78 m³/sec in Allain and 1.38 to 7.31 m³/sec in Duhangan stream. The average, 50% and 90% dependable flows on ten-daily basis on Allain and Duhangan streams as shown in *Table 2*. Thus 90% dependable combined flow estimated is 4.467 m³/sec. The construction of diversion structures during operation phase will result in disturbance of the existing flow pattern of the two streams. It is anticipated that present flow on Allain stream from barrage site to tailrace discharge point (about 5.6km) will be reduced, which may result in significant impact on downstream flow, velocity and levels in comparison to the present flow pattern. Similarly, on Duhangan stream the diversion is proposed to join flow into forebay reservoir and the proposed diversion will result in reduced flow in its stretch of about 6.5km downstream weir location till its confluence in Beas River. This may result in significant impact on downstream flow, velocity and levels in comparison to the present flow pattern.

An analysis of flow pattern has been carried out for the two streams for the period of minimum discharge (i.e. between October & March) during 1973 - 74 to 1994 - 95. The flow pattern represents locations monitored at the proposed Allain Barrage site and downstream at Aleo on Allain stream. Similarly, on Duhangan the flows were monitored by HP SEB at locations of proposed Duhangan Weir site and downstream near Jagatsukh village. A detailed comparative discharge measurements for Allain at Aleo & Barrage sites and for Duhangan at Jagatsukh & Duhangan weir site is enclosed as *Annex A*.

The flow measurements were also compared with the flow available at diversion sites and downstream at Aleo in Allain and at Jagatsukh in Duhangan streams. An exercise has been undertaken to assess the lean season water availability in the Allain and Duhangan streams through other streams, post proposed diversion structures on respective streams. The difference of the flows i.e. additional flows available in Allain and Duhangan streams are presented in *Table 5*.

1.5.2 Irrigation and Domestic Water Demand

The irrigated land in village Prini is approximately 80 ha while the same in Jagatsukh village is approximately 168 ha. Presently, the major source of water for domestic and irrigation water in the area is met through Pahali stream (Nallah), which has its own catchment area and is located in between the Allain and Duhangan streams. The Allain and Duhangan streams near the project site are separated by approximately 5.5 km of distance.

Some of the irrigation done in Jagatsukh village is dependent upon water from Duhangan stream. Here, villagers have separated out a stream (called *Kuhl* in local language), which is sourced from Kala Nala downstream the proposed diversion point on Duhangan, thus it is expected that proposed diversion will have minor impact on irrigation water requirement by Jagasukh village for irrigation purposes.

The water required for domestic use by villagers of Prini, Hamta and Jagatsukh are mainly met through channels withdrawn from Pahali stream flowing between Allain and Duhangan streams. The water of Pahali stream will not be disturbed by RSWML.

The Department of Manali Town and Country Planning, a Division of Government of Himachal Pradesh has informed that the estimated water requirements for the Allain and Duhangan streams is nearly 100 liters per second for various urban uses.

1.5.3 *Recommended Minimum Water Flow to be Maintained Downstream the Diversion Structures*

Table 5 below shows available additional flow in the range of 0.408 to 0.880 m³/sec through other channels post proposed diversion structure on Allain stream as per data recorded by HP State Electricity Board from 1973 through 1995. The minimum flow contributed by other channels post diversion structure on Allain has been found to be 0.226 m³/sec in the month of February during driest year of 1973-74. It is recommended that RSWML maintain a minimum flow of 0.150 m³/sec (i.e. 150 liters per second or 12,960 m³/day) downstream the Allain barrage all the time. This flow along with minimum flow available through other channels downstream the Allain would make the available flow to be more than 0.376 (0.150 + 0.226) m³/sec i.e. 32,466 m³/day, which is about 21% of the minimum flow ever observed on Allain at Aleo since 1973.

Similarly *Table 5* also shows available additional flow in the range of 0.519 to 1.341 m³/sec through other channels post proposed diversion structure on Duhangan stream as per data recorded by HP State Electricity Board from 1973 through 1995. The minimum flow contributed by other channels post diversion structure on Duhangan has been found to be 0.360 m³/sec in the month of February during 1987-88. It is recommended that RSWML also maintain a minimum flow of 0.150 m³/sec (i.e. 150 liters per second or 12,960 m³/day) downstream the Duhangan-weir structure all the time. This flow along with minimum flow available through other channels downstream the Duhangan would make the available flow to be more than 0.510 (0.150 + 0.360) m³/sec i.e. 44,064 m³/day, which is approximately 40% of the ever observed minimum flow on Duhangan stream at Jagatsukh since 1973.

The minimum recommended discharges downstream the Allain and Duhangan are to be maintained so as to maintain ecological sustenance and local demand downstream. RSWML is to ensure this monitoring of minimum recommended water flow by installing electronic and manual measurements devices at the diversion structures.

Further, there will be change in flow of Allain stream in the stretch of about 1.5km falling between tailrace outlet to the point of confluence in Beas River. In this stretch, a peak flow of approximately 26.8m³/sec (96,480 m³/hr) will be discharged during 4 hours of peak power generation period. This significant impact of increased flow through tailrace discharge would result in increased level and discharge rate by 8.85 times the present 90% dependable flow in Allain.

Apart from the above, during operation phase, there will be permanent submergence of flat forestland to the tune of 4 ha near proposed Allain barrage for erection of diversion structure and submergence of another 2.3 ha of land proposed for Intermediate Reservoir and 6.0 ha for Forebay Reservoir locations.

Another low probable potential impact on hydrology during operation phase can be due to failure of intermediate or forebay impoundment. In the event of failure of the water storage impoundment it would result in high soil erosion, loss to ecology and structures along its path with a risk of accidents. However, construction of two reservoirs in place of one may result in low risk of damage to the downstream ecology and other resources.

Table 5: Additional Flow (m³/sec) Available through other streams charging Allain and Duhangan Streams post proposed diversion structures

Lean Months	Difference of Flow at Diversion Structure and Downstream before confluence with Beas River (Additional Flow Available downstream) m³/sec																						
	73-74	74-75	75-76	76-77	77-78	78-79	79-80	80-81	81-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92	92-93	93-94	94-95	Avg. 22 Yrs
Allain Stream																							
Oct.	0.421	0.380	1.623	0.834	1.194	0.857	0.749	0.722	0.692	0.830	1.183	0.716	0.842	0.775	0.951	0.893	1.659	0.620	0.778	0.922	0.738	0.976	0.880
Nov.	0.333	0.333	1.001	0.794	0.813	0.615	0.557	0.555	0.522	0.682	0.801	0.700	0.585	0.573	0.548	0.391	0.565	0.483	0.482	0.663	0.488	0.765	0.602
Dec.	0.281	0.257	0.693	0.550	0.593	0.534	0.453	0.453	0.399	0.572	0.656	0.553	0.515	0.492	0.345	0.351	0.438	0.392	0.421	0.438	0.368	0.457	0.464
Jan.	0.235	0.265	0.509	0.420	0.490	0.449	0.428	0.381	0.412	0.519	0.645	0.555	0.510	0.505	0.305	0.351	0.341	0.324	0.405	0.363	NA*	0.440	0.422
Feb.	0.226	0.294	0.424	0.340	0.402	0.413	0.397	0.375	0.417	0.475	0.467	0.500	0.514	0.513	0.335	0.344	0.348	0.337	0.418	0.348	NA	0.671	0.408
March	0.261	0.283	0.468	0.334	0.371	0.453	0.457	0.410	0.443	0.548	0.534	0.499	0.547	0.585	0.425	0.366	0.420	0.415	0.441	0.350	NA	0.434	0.431
Duhangan Stream																							
Oct.	0.901	1.384	2.829	1.418	1.436	1.545	0.941	1.053	0.900	0.920	1.392	1.011	1.575	1.216	1.001	1.741	1.018	1.031	1.427	1.569	1.551	1.636	1.341
Nov.	1.042	1.205	1.737	1.016	0.898	0.898	0.631	0.630	0.668	0.704	0.875	0.679	1.002	0.870	0.751	0.841	0.693	0.616	0.720	0.815	0.959	0.950	0.873
Dec.	0.966	0.714	1.041	0.817	0.618	0.668	0.522	0.563	0.502	0.693	0.724	0.559	0.685	0.779	0.440	0.554	0.518	0.448	0.568	0.502	0.666	0.761	0.650
Jan.	0.641	0.782	0.902	0.617	0.603	0.596	0.465	0.508	0.497	0.662	0.633	0.488	0.523	0.592	0.388	0.420	0.496	0.415	0.468	0.437	NA	0.567	0.557
Feb.	0.641	0.929	0.878	0.532	0.531	0.567	0.454	0.465	0.524	0.555	0.434	0.498	0.437	0.442	0.360	0.408	0.471	0.416	0.469	0.422	NA	0.467	0.519
March	0.523	0.865	0.891	0.568	0.545	0.645	0.472	0.518	0.594	0.659	0.598	0.588	0.538	0.498	0.481	0.415	0.567	0.544	0.656	0.562	NA	0.563	0.585

* NA - Flow Data Not Available; The bolded figures represents minimum flow available

Annex A

Flow Measurements Upstream of Proposed Diversion Structures and Downstream on Allain and Duhangan Streams

ALLAIN DUHANGAN HYDROELECTRIC PROJECT
Discharge (Q, cum/sec) observed on Allain River at Aleo and Allain Barrage Site

		73.74			74.75			75.76			76.77			77.78			78.79			79.80			80.81		
		At Aleo (Qa)	Barrage (Qb)	Diff Qa-Qb	At Aleo (Qa)	Barrage (Qb)	Diff Qa-Qb	At Aleo (Qa)	Barrage (Qb)	Diff Qa-Qb	At Aleo (Qa)	Barrage (Qb)	Diff Qa-Qb	At Aleo (Qa)	Barrage (Qb)	Diff Qa-Qb	At Aleo (Qa)	Barrage (Qb)	Diff Qa-Qb	At Aleo (Qa)	Barrage (Qb)	Diff Qa-Qb	At Aleo (Qa)	Barrage (Qb)	Diff Qa-Qb
Oct	I	3.930	3.508	0.422	3.980	3.553	0.427	17.410	15.541	1.869	10.093	9.010	1.083	13.035	11.636	1.399	9.280	8.284	0.996	8.100	7.231	0.869	7.670	6.865	0.805
	II	3.930	3.508	0.422	3.590	3.205	0.385	15.820	14.122	1.698	6.125	5.468	0.657	10.324	9.216	1.108	7.940	7.088	0.852	6.740	6.017	0.723	6.670	5.951	0.716
	III	3.900	3.481	0.419	3.050	2.723	0.327	12.130	10.828	1.302	7.091	6.330	0.761	10.022	8.946	1.076	6.730	6.008	0.722	6.090	5.136	0.954	6.020	5.374	0.646
October Average Addition		0.421			0.380			1.623			0.834			1.194			0.857			0.749			0.722		
Nov	I	3.350	2.990	0.360	3.250	2.901	0.349	9.970	8.900	1.070	8.650	7.722	0.928	7.829	6.989	0.840	5.920	5.285	0.635	5.680	5.070	0.610	5.540	4.945	0.595
	II	2.970	2.651	0.319	3.180	2.839	0.341	9.530	8.507	1.023	6.929	6.185	0.744	7.175	6.405	0.770	5.640	5.035	0.605	5.300	4.731	0.569	5.080	4.535	0.545
	III	2.980	2.660	0.320	2.880	2.571	0.309	8.770	7.829	0.941	6.616	5.906	0.710	7.715	6.887	0.828	5.630	5.026	0.604	4.590	4.097	0.493	4.880	4.356	0.524
November Average Addition		0.333			0.333			1.011			0.794			0.813			0.615			0.557			0.555		
Dec	I	2.680	2.392	0.288	2.430	2.169	0.261	7.910	7.061	0.849	6.640	5.927	0.713	6.070	5.418	0.652	5.210	4.651	0.559	4.340	3.874	0.466	4.520	4.035	0.485
	II	2.680	2.392	0.288	2.280	2.035	0.245	5.940	5.302	0.638	4.560	4.071	0.489	5.450	4.865	0.585	4.950	4.419	0.531	4.240	3.785	0.455	4.160	3.713	0.447
	III	2.500	2.232	0.268	2.470	2.205	0.265	5.520	4.927	0.593	4.185	3.736	0.449	5.040	4.499	0.541	4.770	4.258	0.512	4.090	3.651	0.439	3.990	3.562	0.428
December Average Addition		0.281			0.257			0.693			0.550			0.593			0.534			0.453			0.453		
Jan	I	2.660	2.374	0.286	2.140	1.910	0.230	4.980	4.445	0.535	4.330	3.865	0.465	4.710	4.204	0.506	4.410	3.937	0.473	4.180	3.731	0.449	3.720	3.321	0.399
	II	1.980	1.767	0.213	2.450	2.187	0.263	4.790	4.276	0.514	4.036	3.603	0.433	4.540	4.053	0.487	4.200	3.749	0.451	4.010	3.580	0.430	3.570	3.187	0.383
	III	1.920	1.714	0.206	2.810	2.508	0.302	4.450	3.972	0.478	3.382	3.019	0.363	4.450	3.972	0.478	3.940	3.517	0.423	3.760	3.356	0.404	3.370	3.008	0.362
January Average Addition		0.235			0.265			0.509			0.420			0.490			0.449			0.428			0.381		
Feb	I	1.840	1.642	0.198	2.810	2.508	0.302	4.693	4.189	0.504	3.160	2.821	0.339	4.030	3.597	0.433	3.870	3.455	0.415	3.610	3.223	0.387	3.270	2.919	0.351
	II	1.740	1.553	0.187	2.470	2.205	0.265	3.765	3.361	0.404	3.120	2.785	0.335	3.630	3.240	0.390	3.800	3.392	0.408	3.540	3.160	0.380	3.450	3.080	0.370
	III	2.730	2.437	0.293	2.930	2.615	0.315	3.396	3.031	0.365	3.221	2.875	0.346	3.560	3.178	0.382	3.870	3.455	0.415	3.960	3.535	0.425	3.750	3.347	0.403
February Average Addition		0.226			0.294			0.424			0.340			0.402			0.413			0.397			0.375		
Mar	I	2.010	1.794	0.216	2.530	2.258	0.272	3.930	3.508	0.422	2.815	2.513	0.302	3.520	3.142	0.378	3.680	3.285	0.395	4.090	3.651	0.439	3.620	3.231	0.389
	II	2.410	2.178	0.262	2.650	2.366	0.284	4.680	4.178	0.502	3.042	2.715	0.327	3.590	3.205	0.385	4.080	3.642	0.438	3.980	3.553	0.427	3.610	3.223	0.387
	III	2.810	2.515	0.305	2.720	2.428	0.292	4.470	3.990	0.480	3.469	3.097	0.372	3.260	2.910	0.350	4.080	4.374	0.526	4.700	4.195	0.505	4.220	3.767	0.453
March Average Addition		0.261			0.283			0.468			0.334			0.371			0.453			0.457			0.410		

ALLAIN DUHANGAN HYDROELECTRIC PROJECT
Discharge (Q, cum/sec) observed on Allain River at Aleo and Allain Bar

		81-82			82-83			83-84			84-85			85-86			86-87			87-88			88-89		
		At Aleo (Qa)	Barrage (Qb)	Diff Qa-Qb	At Aleo (Qa)	Barrage (Qb)	Diff Qa-Qb	At Aleo (Qa)	Barrage (Qb)	Diff Qa-Qb	At Aleo (Qa)	Barrage (Qb)	Diff Qa-Qb	At Aleo (Qa)	Barrage (Qb)	Diff Qa-Qb	At Aleo (Qa)	Barrage (Qb)	Diff Qa-Qb	At Aleo (Qa)	Barrage (Qb)	Diff Qa-Qb	At Aleo (Qa)	Barrage (Qb)	Diff Qa-Qb
Oct	I	7.480	6.677	0.803	8.810	7.864	0.946	12.090	10.792	1.298	7.300	6.516	0.784	8.500	7.588	0.912	8.560	7.641	0.919	10.340	9.409	1.131	11.600	10.355	1.245
	II	6.290	5.615	0.675	7.610	6.793	0.817	11.420	10.194	1.226	6.500	5.802	0.698	7.990	7.132	0.858	7.060	6.302	0.758	8.740	7.802	0.938	8.210	7.329	0.881
	III	5.560	4.963	0.597	6.770	6.043	0.727	9.540	8.516	1.024	6.200	5.534	0.666	7.040	6.284	0.756	6.030	5.383	0.647	7.290	6.507	0.783	5.160	4.606	0.554
October Average Addition		0.692			0.830			1.183			0.716			0.842			0.775			0.951			0.893		
Nov	I	5.580	4.981	0.599	6.690	5.972	0.718	8.710	7.775	0.935	8.090	7.222	0.868	6.220	5.552	0.668	5.650	5.044	0.606	5.870	5.240	0.630	3.940	3.517	0.423
	II	4.780	4.267	0.513	6.470	5.776	0.694	7.250	6.472	0.778	5.890	5.258	0.632	5.330	4.758	0.572	5.290	4.722	0.568	5.140	4.588	0.552	3.420	3.053	0.367
	III	4.240	3.785	0.455	5.900	5.267	0.633	6.440	5.749	0.691	5.580	4.981	0.599	4.790	4.276	0.514	5.080	4.535	0.545	4.310	3.847	0.463	3.560	3.178	0.382
November Average Addition		0.522			0.682			0.801			0.700			0.585			0.573			0.548			0.391		
Dec	I	4.060	3.624	0.436	5.470	4.883	0.587	6.130	5.472	0.658	5.290	4.722	0.568	4.630	4.133	0.497	4.710	4.204	0.506	3.530	3.151	0.379	3.490	3.115	0.375
	II	3.660	3.267	0.393	5.310	4.740	0.570	6.150	5.490	0.660	5.130	4.579	0.551	4.910	4.383	0.527	4.520	4.035	0.485	3.240	2.892	0.348	3.150	2.812	0.338
	III	3.440	3.071	0.369	5.200	4.642	0.558	6.060	5.410	0.650	5.030	4.490	0.540	4.840	4.320	0.520	4.530	4.044	0.486	2.860	2.553	0.307	3.170	2.830	0.340
December Average Addition		0.399			0.572			0.656			0.553			0.515			0.492			0.345			0.351		
Jan	I	3.490	3.115	0.375	5.200	4.642	0.558	6.070	5.418	0.652	5.260	4.695	0.565	4.790	4.276	0.514	4.560	4.071	0.489	2.760	2.464	0.296	3.200	2.857	0.343
	II	3.940	3.517	0.423	4.880	4.356	0.524	6.040	5.392	0.648	5.160	4.606	0.554	4.680	4.178	0.502	4.770	4.258	0.512	2.840	2.535	0.305	3.220	2.874	0.346
	III	4.070	3.633	0.437	4.420	3.946	0.474	5.920	5.285	0.635	5.080	4.535	0.545	4.800	4.285	0.515	4.780	4.267	0.513	2.920	2.607	0.313	3.390	3.026	0.364
January Average Addition		0.412			0.519			0.645			0.555			0.510			0.505			0.305			0.351		
Feb	I	3.890	3.472	0.418	4.370	3.901	0.469	4.420	3.946	0.474	4.830	4.312	0.518	4.820	4.303	0.517	4.700	4.195	0.505	2.920	2.607	0.313	3.330	2.973	0.357
	II	3.900	3.481	0.419	4.430	3.954	0.476	4.370	3.901	0.469	4.750	4.240	0.510	4.730	4.222	0.508	4.700	4.195	0.505	3.210	2.865	0.345	3.140	2.803	0.337
	III	3.870	3.455	0.415	4.480	3.999	0.481	4.260	3.803	0.457	4.400	3.928	0.472	4.810	4.294	0.516	4.930	4.401	0.529	3.230	2.883	0.347	3.150	2.812	0.338
February Average Addition		0.417			0.475			0.467			0.500			0.514			0.513			0.335			0.344		
Mar	I	3.890	3.472	0.418	4.950	4.419	0.531	4.530	4.044	0.486	4.580	4.088	0.492	4.630	4.133	0.497	4.960	4.428	0.532	3.770	3.365	0.405	3.250	2.901	0.349
	II	3.850	3.437	0.413	4.930	4.401	0.529	4.880	4.356	0.524	4.630	4.133	0.497	5.290	4.722	0.568	5.690	5.079	0.611	4.320	3.856	0.464	3.390	3.026	0.364
	III	4.610	4.133	0.477	5.430	4.847	0.583	5.510	4.919	0.591	4.740	4.231	0.509	5.380	4.803	0.577	5.690	5.079	0.611	3.770	3.365	0.405	3.580	3.196	0.384
March Average Addition		0.443			0.548			0.534			0.499			0.547			0.585			0.425			0.366		

rage Site

		89-90			90-91			91-92			92-93			93-94			94-95			Average Addition al flow between
		At Aleo (Qa)	Barrage (Qb)	Diff Qa-Qb	At Aleo (Qa)	Barrage (Qb)	Diff Qa-Qb	At Aleo (Qa)	Barrage (Qb)	Diff Qa-Qb	At Aleo (Qa)	Barrage (Qb)	Diff Qa-Qb	At Aleo (Qa)	Barrage (Qb)	Diff Qa-Qb	At Aleo (Qa)	Barrage (Qb)	Diff Qa-Qb	
Oct	I	6.660	5.945	0.715	7.000	6.249	0.751	8.410	7.507	0.903	9.590	8.561	1.029	7.570	6.757	0.813	9.910	8.562	1.348	
	II	5.890	5.258	0.632	5.390	4.811	0.579	7.500	6.695	0.805	8.730	7.793	0.937	6.650	5.936	0.714	8.810	7.612	1.198	
	III	5.880	2.249	3.631	4.950	4.419	0.531	5.840	5.213	0.627	7.450	6.650	0.800	6.390	5.704	0.686	7.690	7.309	0.381	
October Average Addition		1.659			0.620			0.778			0.922			0.738			0.976			0.880
Nov	I	5.340	4.767	0.573	5.140	4.588	0.552	4.990	4.454	0.536	6.720	5.999	0.721	5.870	5.240	0.630	6.180	5.340	0.840	
	II	5.450	4.865	0.585	4.350	3.883	0.467	4.440	3.963	0.477	6.210	5.543	0.667	5.130	4.579	0.551	5.670	4.899	0.771	
	III	5.000	4.463	0.537	4.010	3.580	0.430	4.020	3.588	0.432	5.590	4.990	0.600	4.130	3.847	0.283	5.020	4.337	0.683	
November Average Addition		0.565			0.483			0.482			0.663			0.488			0.765			0.603
Dec	I	4.430	3.954	0.476	3.920	3.499	0.421	3.790	3.383	0.407	4.250	3.794	0.456	3.770	3.365	0.405	4.600	3.974	0.626	
	II	4.110	3.669	0.441	3.920	3.499	0.421	3.920	3.499	0.421	3.680	3.285	0.395	3.400	3.035	0.365	4.100	3.542	0.558	
	III	3.690	3.294	0.396	3.100	2.767	0.333	4.060	3.624	0.436	3.570	3.107	0.463	3.110	2.776	0.334	3.780	3.593	0.187	
December Average Addition		0.438			0.392			0.421			0.438			0.368			0.457			0.464
Jan	I	3.380	3.017	0.363	3.000	2.678	0.322	3.830	3.419	0.411	3.510	3.133	0.377	NA			3.750	3.084	0.666	
	II	2.980	2.660	0.320	3.110	2.776	0.334	3.790	3.383	0.407	3.450	3.080	0.370	NA			3.540	3.059	0.481	
	III	3.160	2.821	0.339	2.930	2.615	0.315	3.690	3.294	0.396	3.180	2.839	0.341	NA			3.460	3.288	0.172	
January Average Addition		0.341			0.324			0.405			0.363			0.000			0.440			0.421
Feb	I	3.110	2.776	0.334	3.060	2.732	0.328	3.860	3.446	0.414	3.230	2.883	0.347	NA			3.440	2.972	0.468	
	II	3.310	2.955	0.355	3.090	2.758	0.332	3.920	3.499	0.421	3.300	2.946	0.354	NA			3.570	3.084	0.486	
	III	3.320	2.964	0.356	3.260	2.910	0.350	3.890	3.472	0.418	3.190	2.848	0.342	NA			3.430	2.371	1.059	
February Average Addition		0.348			0.337			0.418			0.348			0.000			0.671			0.407
Mar	I	3.260	2.910	0.350	3.590	3.205	0.385	4.040	3.606	0.434	3.070	2.740	0.330	NA			3.680	3.180	0.500	
	II	3.710	3.312	0.398	3.750	3.347	0.403	4.160	3.713	0.447	3.300	2.946	0.354	NA			4.170	3.603	0.567	
	III	4.760	4.219	0.541	4.260	3.803	0.457	4.120	3.678	0.442	3.410	3.044	0.366	NA			4.740	4.505	0.235	
March Average Addition		0.420			0.415			0.441			0.350			0.000			0.434			0.431

ALLAIN DUHANGAN HYDROELECTRIC PROJECT
Discharge (Q, cum/sec) observed on Duhangan River at JagatSukh (J.S.) and Weir Site

		73-74			74-75			75-76			76-77			77-78			78-79			79-80			80-81		
		At J.S. (Qa)	Weir (Qb)	Diff Qa-Qb	At J.S. (Qa)	Weir (Qb)	Diff Qa-Qb	At J.S. (Qa)	Weir (Qb)	Diff Qa-Qb	At J.S. (Qa)	Weir (Qb)	Diff Qa-Qb	At J.S. (Qa)	Weir (Qb)	Diff Qa-Qb	At J.S. (Qa)	Weir (Qb)	Diff Qa-Qb	At J.S. (Qa)	Weir (Qb)	Diff Qa-Qb	At J.S. (Qa)	Weir (Qb)	Diff Qa-Qb
Oct	I	NA	5.166		5.066	3.661	1.405	12.344	8.921	3.423	5.621	4.062	1.559	6.535	4.723	1.812	7.560	5.464	2.096	4.100	2.963	1.137	4.900	3.541	1.359
	II	4.920	3.556	1.364	5.176	3.741	1.435	10.311	7.452	2.859	5.199	3.757	1.442	4.630	3.346	1.284	4.930	3.563	1.367	3.340	2.414	0.926	3.550	2.566	0.984
	III	4.825	3.487	1.338	4.730	3.418	1.312	7.949	5.745	2.204	4.522	3.268	1.254	4.367	3.156	1.211	4.223	3.052	1.171	2.740	1.980	0.760	2.940	2.125	0.815
October Average																									
Addition			0.901			1.384			2.829			1.418			1.436			1.545		0.911				1.053	
Nov	I		3.730			4.600			7.806			3.802			3.685			3.682		2.550				2.660	
	II	3.915	2.829	1.086	4.608	3.330	1.278	5.730	4.141	1.589	3.689	2.666	1.023	3.256	2.353	0.903	3.107	2.245	0.862	2.190	1.583	0.607	2.510	1.814	0.696
	III	3.631	2.624	1.007	3.821	2.761	1.060	5.250	3.794	1.456	3.498	2.528	0.970	2.774	2.005	0.769	2.920	2.110	0.810	2.090	1.510	0.580	1.640	1.185	0.455
November Average																									
Addition			1.012			1.205			1.737			1.016			0.898			0.898		0.611				0.630	
Dec	I	3.486	2.519	0.967	2.751	1.988	0.763	4.510	3.259	1.251	3.388	2.449	0.939	2.479	1.792	0.687	2.274	1.643	0.631	1.990	1.438	0.552	2.130	1.539	0.591
	II	3.654	2.641	1.013	2.641	1.909	0.732	3.480	2.515	0.965	2.952	2.133	0.819	2.155	1.557	0.598	2.619	1.893	0.726	1.830	1.323	0.507	2.010	1.453	0.557
	III	3.311	2.393	0.918	2.328	1.682	0.646	3.270	2.363	0.907	2.494	1.802	0.692	2.056	1.486	0.570	2.330	1.684	0.646	1.830	1.323	0.507	1.950	1.409	0.541
December Average																									
Addition			0.964			0.714			1.011			0.817			0.618			0.568		0.522				0.563	
Jan	I	2.534	1.831	0.703	2.492	1.801	0.691	3.840	2.775	1.065	2.368	1.711	0.657	2.145	1.550	0.595	2.200	1.590	0.610	1.750	1.265	0.485	1.930	1.395	0.535
	II	2.097	1.516	0.581	2.924	2.113	0.811	2.950	2.132	0.818	2.250	1.626	0.624	2.246	1.623	0.623	2.170	1.568	0.602	1.840	1.185	0.455	1.910	1.380	0.530
	III	2.301	1.663	0.638	3.047	2.202	0.845	2.970	2.146	0.824	2.058	1.487	0.571	2.131	1.540	0.591	2.080	1.503	0.577	1.640	1.185	0.455	1.650	1.192	0.458
January Average																									
Addition			0.641			0.782			0.902			0.617			0.603			0.596		0.465				0.508	
Feb	I	2.371	1.714	0.657	3.986	2.881	1.105	3.600	2.602	0.998	1.955	1.413	0.542	1.962	1.418	0.544	2.001	1.446	0.555	1.640	1.185	0.455	1.620	1.171	0.449
	II	2.240	1.619	0.621	3.022	2.184	0.838	2.960	2.139	0.821	1.900	1.373	0.527	1.848	1.336	0.512	2.126	1.536	0.590	1.620	1.171	0.449	1.730	1.250	0.480
	III	2.330	1.684	0.646	3.046	2.201	0.845	2.940	2.125	0.815	1.900	1.373	0.527	1.933	1.397	0.536	2.010	1.453	0.557	1.650	1.192	0.458	1.680	1.214	0.466
February Average																									
Addition			0.611			0.929			0.878			0.532			0.531			0.567		0.454				0.465	
Mar	I	1.758	1.271	0.487	2.998	2.167	0.831	3.200	2.313	0.887	1.931	1.396	0.535	1.811	1.309	0.502	2.039	1.474	0.565	1.650	1.192	0.458	1.710	1.236	0.474
	II	1.838	1.328	0.510	3.138	2.268	0.870	3.090	2.233	0.857	2.087	1.508	0.579	1.998	1.444	0.554	2.277	1.646	0.631	1.650	1.192	0.458	1.860	1.344	0.516
	III	2.065	1.492	0.573	3.224	2.330	0.894	3.350	2.421	0.929	2.129	1.539	0.590	2.085	1.507	0.578	2.660	1.922	0.738	1.800	1.301	0.499	2.030	1.467	0.563
March Average																									
Addition			0.521			0.865			0.891			0.568			0.545			0.645		0.472				0.518	

		81-82			82-83			83-84			84-85			85-86			86-87			87-88			88-89		
		At J.S. (Qa)	Weir (Qb)	Diff Qa-Qb	At J.S. (Qa)	Weir (Qb)	Diff Qa-Qb	At J.S. (Qa)	Weir (Qb)	Diff Qa-Qb	At J.S. (Qa)	Weir (Qb)	Diff Qa-Qb	At J.S. (Qa)	Weir (Qb)	Diff Qa-Qb	At J.S. (Qa)	Weir (Qb)	Diff Qa-Qb	At J.S. (Qa)	Weir (Qb)	Diff Qa-Qb	At J.S. (Qa)	Weir (Qb)	Diff Qa-Qb
Oct	I	3.870	2.797	1.073	3.960	2.862	1.098	5.770	4.170	1.600	4.250	3.072	1.178	6.140	4.437	1.703	5.450	3.939	1.511	4.130	2.985	1.145	8.360	6.042	2.318
	II	3.170	2.291	0.879	3.210	2.320	0.890	5.040	3.642	1.398	3.650	2.638	1.012	6.000	4.336	1.664	4.300	3.108	1.192	3.470	2.508	0.962	5.750	4.156	1.594
	III	2.700	1.951	0.749	2.780	2.009	0.771	4.250	3.072	1.178	3.040	2.197	0.843	4.900	3.541	1.359	3.410	2.464	0.946	3.230	2.334	0.896	4.730	3.418	1.312
October Average Addition		0.900			0.920			1.392			1.011			1.575			1.216			1.001			1.741		
Nov	I		2.620			2.690			3.670			2.690			3.900			3.250			2.720			3.960	
	II	2.410	1.742	0.668	2.610	1.886	0.724	3.060	2.211	0.849	2.430	1.756	0.674	3.640	2.631	1.009	3.140	2.239	0.901	3.330	2.407	0.923	2.960	2.139	0.821
	III	2.200	1.590	0.610	2.310	1.669	0.641	2.730	1.973	0.757	2.230	1.612	0.618	3.300	2.385	0.915	2.910	2.103	0.807	2.080	1.503	0.577	2.480	1.792	0.688
November Average Addition		0.668			0.704			0.875			0.679			1.002			0.870			0.751			0.841		
Dec	I	2.060	1.503	0.557	2.210	1.597	0.613	2.670	1.930	0.740	2.120	1.532	0.588	2.810	2.031	0.779	2.890	2.081	0.809	1.750	1.265	0.485	2.220	1.604	0.616
	II	1.800	1.301	0.499	2.700	1.951	0.749	2.630	1.901	0.729	2.020	1.460	0.560	2.500	1.807	0.693	2.780	2.009	0.771	1.570	1.135	0.435	2.070	1.496	0.574
	III	1.620	1.171	0.449	2.590	1.872	0.718	2.540	1.836	0.704	1.910	1.380	0.530	2.100	1.518	0.582	2.730	1.973	0.757	1.440	1.041	0.399	1.700	1.229	0.471
December Average Addition		0.502			0.693			0.724			0.559			0.685			0.779			0.480			0.524		
Jan	I	1.690	1.221	0.469	2.560	1.850	0.710	2.380	1.720	0.660	1.840	1.330	0.510	1.830	1.323	0.507	2.420	1.749	0.671	1.420	1.026	0.394	1.570	1.135	0.435
	II	1.860	1.344	0.516	2.400	1.734	0.666	2.280	1.648	0.632	1.800	1.301	0.499	2.020	1.460	0.560	2.110	1.525	0.585	1.440	1.041	0.399	1.470	1.062	0.408
	III	1.830	1.323	0.507	2.200	1.590	0.610	2.190	1.583	0.607	1.640	1.185	0.455	1.810	1.308	0.502	1.870	1.351	0.519	1.340	0.968	0.372	1.500	1.084	0.416
January Average Addition		0.497			0.662			0.633			0.488			0.523			0.592			0.388			0.420		
Feb	I	1.870	1.351	0.519	2.210	1.597	0.613	1.600	1.156	0.444	1.670	1.207	0.463	1.560	1.127	0.433	1.740	1.258	0.482	1.270	0.918	0.352	1.440	1.041	0.399
	II	1.920	1.388	0.532	1.700	1.229	0.471	1.590	1.149	0.441	1.810	1.308	0.502	1.490	1.077	0.413	1.560	1.127	0.433	1.280	0.925	0.355	1.470	1.062	0.408
	III	1.880	1.359	0.521	2.090	1.510	0.580	1.500	1.084	0.416	1.910	1.380	0.530	1.680	1.214	0.466	1.480	1.070	0.410	1.350	0.976	0.374	1.500	1.084	0.416
February Average Addition		0.524			0.555			0.434			0.498			0.437			0.442			0.360			0.408		
Mar	I	1.880	1.359	0.521	2.270	1.641	0.629	1.900	1.373	0.527	2.180	1.576	0.604	1.920	1.388	0.532	1.540	1.113	0.427	1.420	1.026	0.394	1.510	1.091	0.419
	II	2.080	1.503	0.577	2.440	1.763	0.677	2.010	1.453	0.557	2.070	1.496	0.574	1.960	1.417	0.543	1.840	1.330	0.510	1.640	1.185	0.455	1.440	1.041	0.399
	III	2.470	1.785	0.685	2.420	1.749	0.671	2.560	1.850	0.710	2.110	1.525	0.585	1.940	1.402	0.538	2.010	1.453	0.557	2.140	1.547	0.593	1.540	1.113	0.427
March Average Addition		0.594			0.659			0.598			0.588			0.538			0.498			0.481			0.415		

		89-90			90-91			91-92			92-93			93-94			94-95			Average Addition al flow between
		At J.S. [Qa]	Weir [Qb]	Diff Qa-Qb	At J.S. [Qa]	Weir [Qb]	Diff Qa-Qb	At J.S. [Qa]	Weir [Qb]	Diff Qa-Qb	At J.S. [Qa]	Weir [Qb]	Diff Qa-Qb	At J.S. [Qa]	Weir [Qb]	Diff Qa-Qb	At J.S. [Qa]	Weir [Qb]	Diff Qa-Qb	
Oct	I	4.140	2.992	1.148	4.140	2.992	1.148	6.020	4.351	1.669	7.270	5.254	2.016	6.710	4.849	1.861	7.070	5.110	1.960	
	II	3.660	2.645	1.015	3.800	2.746	1.054	4.700	3.397	1.303	5.590	4.040	1.550	5.430	3.924	1.506	6.050	4.372	1.678	
	III	3.210	2.320	0.890	3.210	2.320	0.890	4.720	3.411	1.309	4.120	2.978	1.142	4.640	3.353	1.287	4.580	3.310	1.270	
October Average Addition		1.018			1.031			1.427			1.569			1.551			1.676			1.341
Nov	I		2.830			2.490			1.920			3.520			3.890			3.840		
	II	2.460	1.778	0.682	2.310	1.669	0.641	3.040	2.197	0.843	3.090	2.233	0.857	3.490	2.522	0.968	3.340	2.414	0.926	
	III	2.210	1.597	0.613	1.860	1.344	0.516	2.830	2.045	0.785	2.210	1.597	0.613	2.990	2.161	0.829	3.100	2.240	0.860	
November Average Addition		0.693			0.616			0.720			0.815			0.959			0.950			0.873
Dec	I	2.070	1.496	0.574	1.640	1.185	0.455	2.310	1.669	0.641	1.960	1.417	0.543	2.770	2.002	0.768	3.010	2.175	0.835	
	II	1.800	1.301	0.499	1.610	1.164	0.446	2.010	1.453	0.557	1.790	1.294	0.496	2.360	1.706	0.654	2.690	1.944	0.746	
	III	1.740	1.258	0.482	1.600	1.156	0.444	1.820	1.315	0.505	1.680	1.214	0.466	2.080	1.503	0.577	2.530	1.828	0.702	
December Average Addition		0.518			0.448			0.568			0.502			0.666			0.761			0.650
Jan	I	1.670	1.207	0.463	1.520	1.099	0.421	1.790	1.294	0.496	1.580	1.142	0.438	NA			2.210	1.597	0.613	
	II	1.770	1.279	0.491	1.470	1.062	0.408	1.640	1.185	0.455	1.570	1.135	0.435	NA			2.100	1.518	0.582	
	III	1.930	1.395	0.535	1.500	1.084	0.416	1.630	1.178	0.452	1.580	1.142	0.438	NA			1.820	1.315	0.505	
January Average Addition		0.496			0.415			0.468			0.437			0.000			0.567			0.557
Feb	I	1.880	1.359	0.521	1.530	1.106	0.424	1.610	1.164	0.446	1.500	1.084	0.416	NA			1.740	1.258	0.482	
	II	1.700	1.229	0.471	1.490	1.077	0.413	1.660	1.200	0.460	1.520	1.099	0.421	NA			1.710	1.236	0.474	
	III	1.520	1.099	0.421	1.480	1.070	0.410	1.810	1.308	0.502	1.550	1.120	0.430	NA			1.600	1.156	0.444	
February Average Addition		0.471			0.416			0.469			0.422			0.000			0.467			0.519
Mar	I	1.940	1.402	0.538	1.570	1.135	0.435	2.030	1.467	0.563	1.940	1.402	0.538	NA			1.700	1.229	0.471	
	II	2.060	1.489	0.571	1.870	1.351	0.519	2.400	1.734	0.666	1.960	1.417	0.543	NA			1.690	1.221	0.469	
	III	2.030	1.467	0.563	2.450	1.771	0.679	2.660	1.922	0.738	2.180	1.576	0.604	NA			2.700	1.951	0.749	
March Average Addition		0.557			0.544			0.656			0.562			0.000			0.563			0.585