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Preface

Water is vital for life. No animal or plant can survive without it. The crop will not grow without supply of adequate water. Yet the same water causes havoc and becomes a terror in the form of floods when the rivers overflow from their banks due to excessive rains in their catchment. During rainy season, our rivers are swollen and cause disastrous floods which cause heavy destruction to life and property. Countries irrigated by an adequate river system are in many ways blessed. These rivers not only help agriculture but they provide a cheap and efficient transport system for the development of internal trade. Land divides, seas unite, but these waterways bring also lot of misery to the people of Pakistan by causing devastating seasonal floods in the rivers Sutlej, Ravi, Chenab, Jhelum, Indus and Kabul almost every rainy season. It brings untold sufferings to the people living in flood plains. Millions are rendered homeless; men and cattle die in large numbers; the damage to property including standing crops is incalculable. Besides, floods affect the health of the locality and increase the incidences of cholera, typhoid and other water-borne diseases. These floods may be due to two natural causes. First, the melting of glaciers on the mountains resulting in enormous volume of water much in excess of rivers capacities, Secondly, heavy rains on the mountains again excess of water supply. In either case, the excess water overflows the embankments and submerges the low-lying plains. Higher release from dams leads to inundation. Natural disasters cannot be controlled by human being .They cannot be stopped but can be mitigated upto some extent. Properties loss is amendable by analyzing the prevailing atmospheric conditions on micro scale, future possible variability in it and then possible accurate forecast .The timely dissemination of the flood information to the concerned authorities, media and public contributes a lot in minimizing the losses due to floods. The Flood Forecasting Division Lahore (FFD), since its establishment is serving the nation by issuing flood forecasts during each flood season (15^{th} June -15^{th} October). Similarly FFD monitored flood season 2013 carefully through its Hydro-Meteorological bulletins, Warnings / Advisories and then informing different Government agencies, press and electronic media, in order to minimize mass destruction. The compilation of flood report after each flood season is a regular feature observed by FFD Lahore. Flood report for the year 2013 has been prepared under the able guidance and kind instructions of Director General.It contains all the details pertaining to flood forecasting like monsoon low's tracks, rainfall during wet spells, flood peaks, monthly and seasonal Isohyetal maps, normal isopercental maps, flood limits and flood evaluation report .

Chief Meteorologist
Flood Forecasting Division
Lahore

1 Highlights

- Monsoon remained active over north & northeast Punjab. Most parts of Kashmir received normal rainfall.
- A total number of seven monsoon lows originated from the Bay of Bengal. However, one of them was able to reach in the vicinity of Pakistan.
- The seasonal precipitation (July 2013 to September 2013) pattern shows slightly above normal rainfall over Punjab, Baluchistan, Khyber Pakhtunkhwa and Gilgit Baltistan. About Normal rainfall was recorded over Azad Kashmir also Sindh province received 21% below normal Rainfall. On all Pakistan basis 5% above normal rainfall was observed during Monsoon season, 2013.
- Eleven rain bearing spells occurred during the monsoon season, 2013.
- The supply of Hydro-Meteorological data from WAPDA, Punjab and Sindh Irrigation departments and Pakistan Commissioner for Indus Water (PCIW) & Drainage Authorities remained satisfactory.
- The concerned federal and provincial authorities along with press and electronic media were also informed daily about the prevailing weather/flood conditions through fax & Internet as well.
- 21 Significant Flood Forecasts /warnings were issued by FFD during Monsoon Season 2013, whenever the weather/flood situation demanded.
- Overall accuracy of forecast issued by FFD during the Season 2013 has been calculated as 93%.

2 Tracks of Lows during Monsoon Season, 2013:

During the monsoon season, 2013 (15th June to 15th October) seven monsoon lows developed over Bay of Bengal. The path followed by each low/depression is shown in figure below.

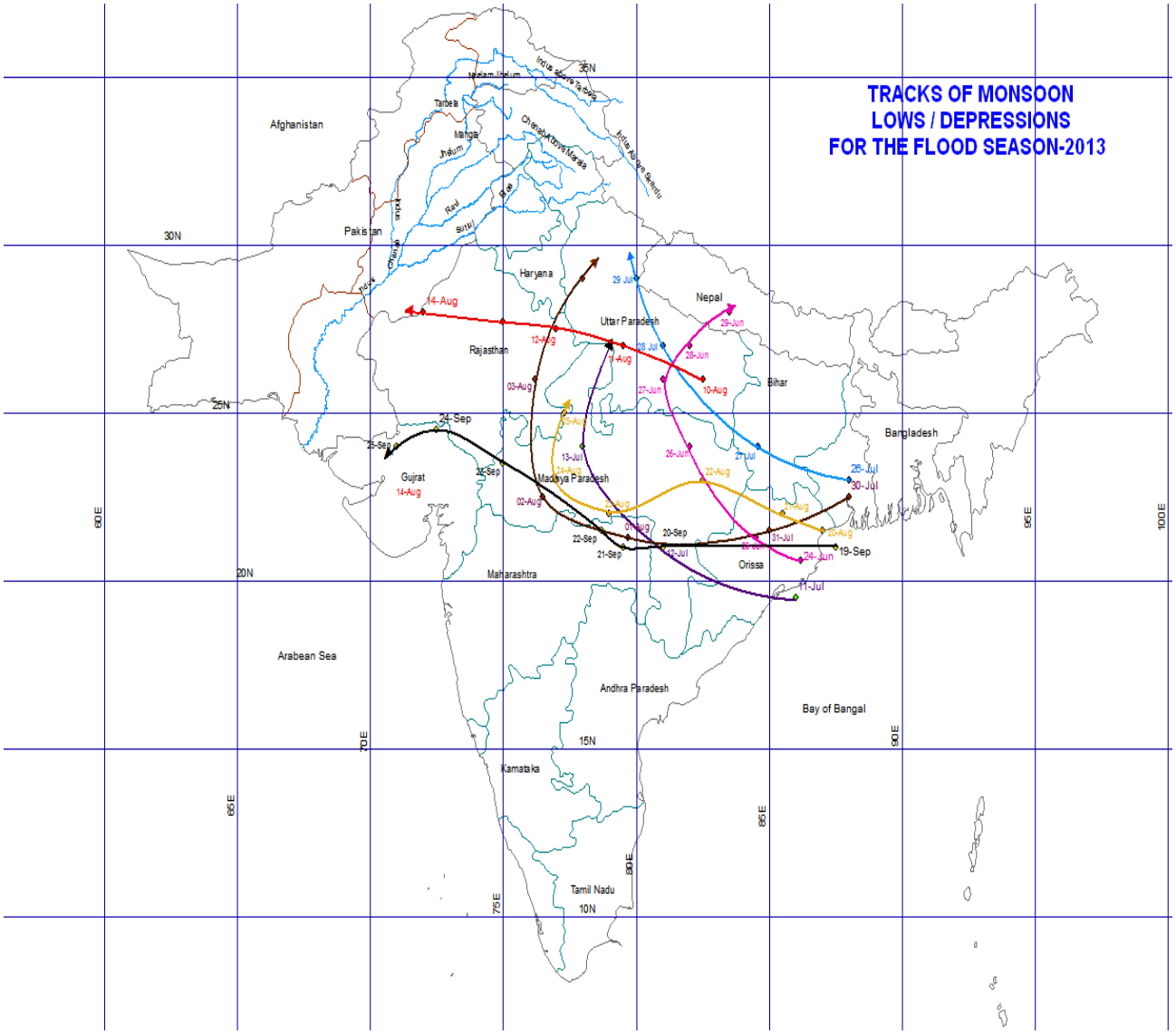


Figure 1: Tracks of Monsoon Lows / depressions during Flood Season-2013

3 Significant Hydro-Meteorological Events during the month of June, 2013:

Only one spell provided significant rainfall.

3.1 Meteorological Events:

Only one monsoonal low developed over Bay of Bengal during the month of June 2013 on 24th, reached over eastern parts of Madhya Pradesh on 26th, from here it moved northwestwards & then northeastwards and finally dissipated on 29th without effecting the country. Mostly the

rainfall occurred across the country during the month was due to the accentuation of seasonal low over Baluchistan and westerly wave in the North of the country.

3.1.1 Wet Spell of June 2013 (from 15-06-2013 to 16-06-2013):

The only wet spell of June 2013 which remained for two days was mainly due to the moist current from the Arabian Sea under the influence of western disturbance . Rainfall distribution during the spell is given below.

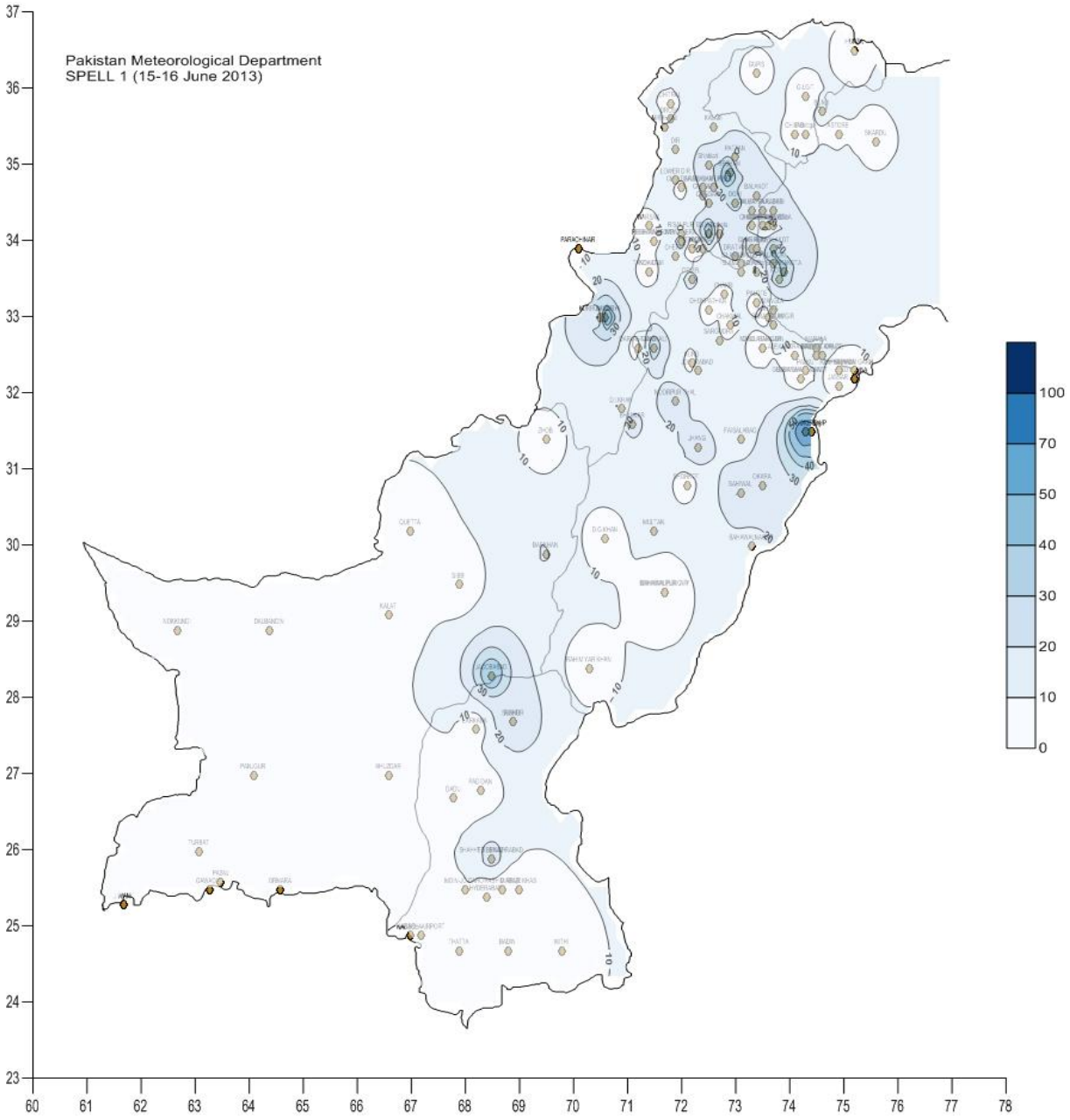
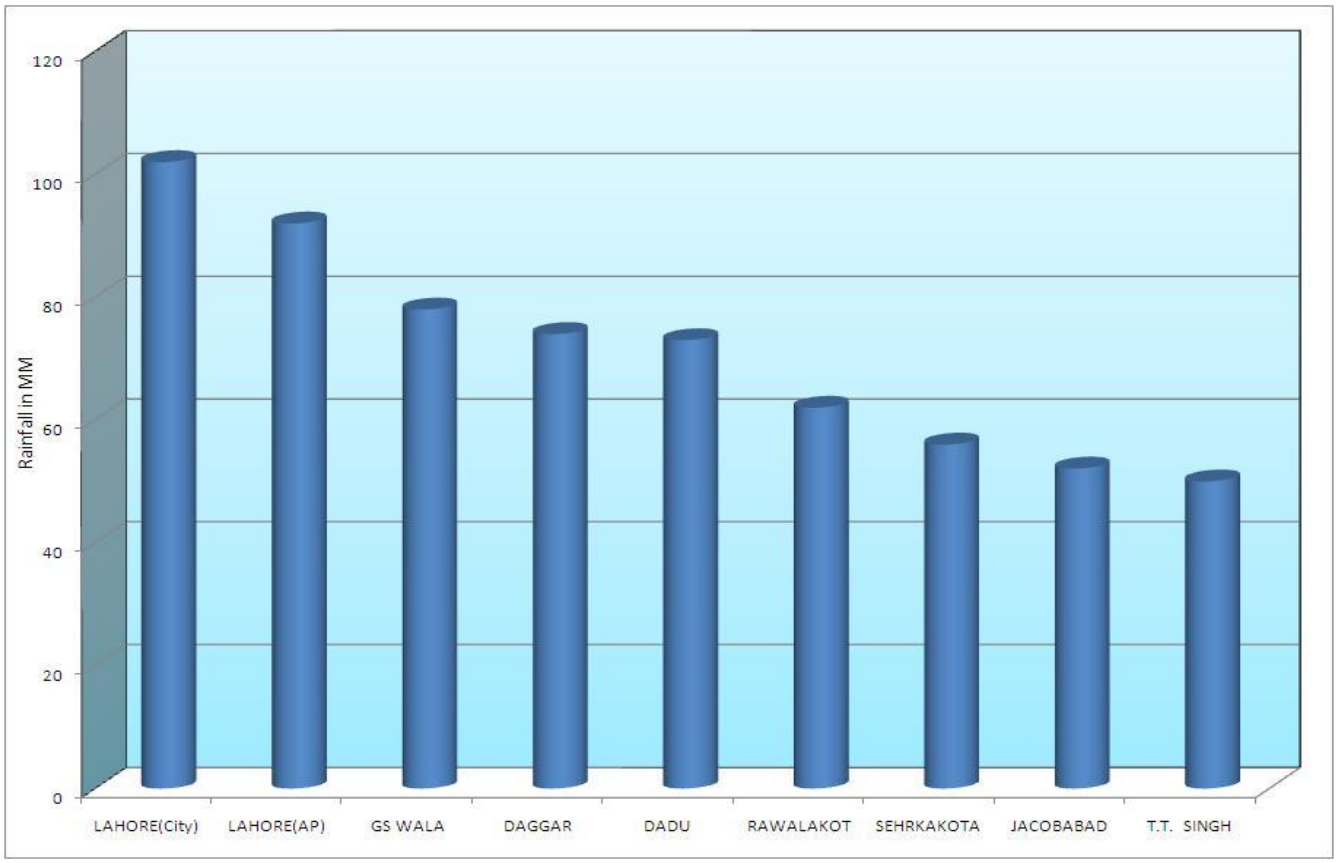


Figure 2: Wet spell of June-2013 (15-16 June-2013)

Significant rainfall more than 50 mm is shown below.



3.1.2 Rivers Position during June, 2013:

Flood peaks recorded during June, 2013 are shown below.

DATE	STATIONS	PEAKS (Cusecs)	FLOOD LEVEL
15/6/2013	MANGLA	76500	LOW
21/6/2013	KALABAGH	262252	LOW
27/6/2013	KABUL	102100	MEDIUM
27/6/2013	MARALA	120935	LOW
28/6/2013	TARBELA	276000	LOW

4 Significant Hydro-Meteorological Events during the month of July, 2013:

Four rainfall spells occurred during the month of July, 2013.

4.1 Meteorological Events:

First spell occurred from 7th to 10th July 2013 was the result of the penetration of moist current from Arabian Sea into sub mountain areas of Punjab & Kashmir under the effect of westerly wave passing over the Northern parts of the country and intensification of well marked position of Seasonal Low. The second spell of July observed during 15th to 18th July, 2013 was caused due to

the interaction of westerly wave passing over the Northern parts of the country and the moist influx from Arabian Sea. Third spell of the Month of July was observed from 20th to 21st July, 2013. It was also caused due to interaction of westerly wave and moist current from Arabian Sea and Bay of Bengal. Fourth and final spell was observed from 24th to 26th July. It was also caused due to interaction of westerly wave and moist current from the above both sources and seasonal low.

4.1.1 First Wet Spell of July, 2013 (07-07-2013 to 10-07-2013):

First spell of July 2013 which was 2nd of the flood season -2013, lasted for 4 days. It was mainly due to the passage of westerly wave, accentuation of seasonal low and incursion of moist current from Arabian Sea. The significant rain during the spell is shown below;

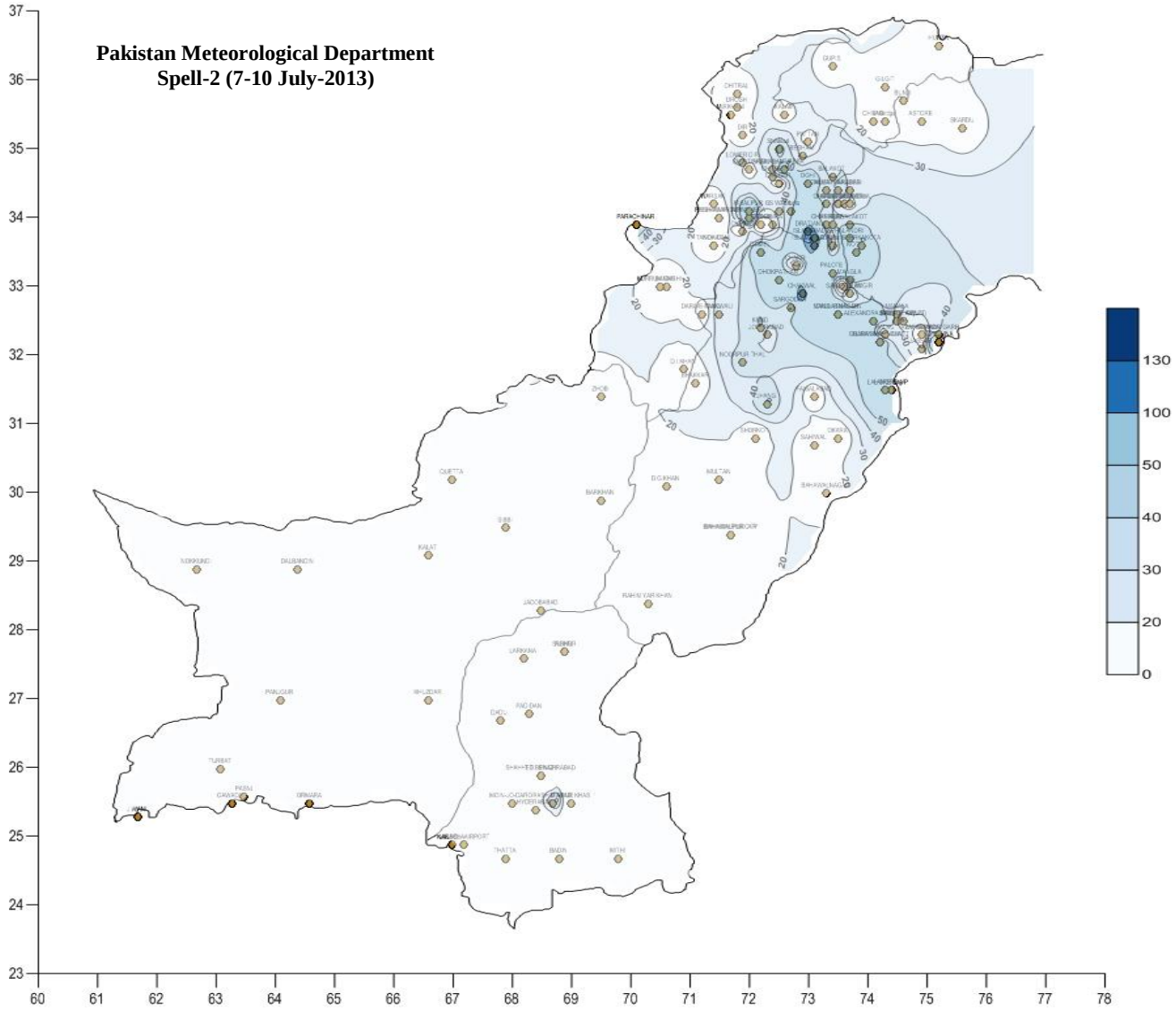
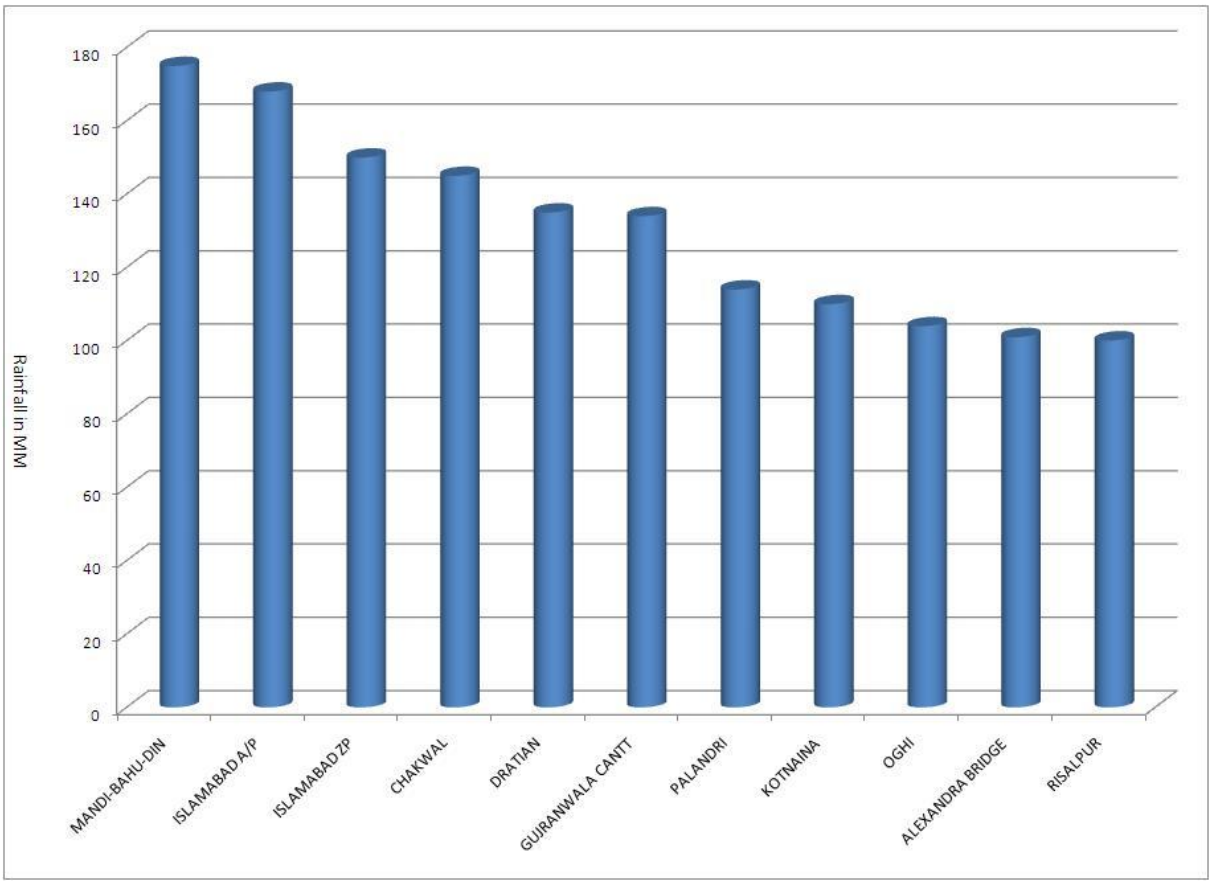


Figure 3: Wet spell of July (7th July – 10th July)

4.1.2 Rivers Position Due to the Spell:

River Kabul at Nowshehra remained in state of Low flood level during the period while river Indus at Tarbela & Kalabagh and river Jhelum at Mangla attained Low flood level during the period.

Significant rainfall more than 100 mm is shown below.



4.1.3 Second Wet Spell of July, 2013 (15-07-2013 to 18-07-2013):

This spell lasted for 4 days. The rainfall of moderate to heavy intensity was recorded at scattered places in Khyber Pakhtunkhwa, while of moderate intensity over Punjab and Kashmir as shown below;

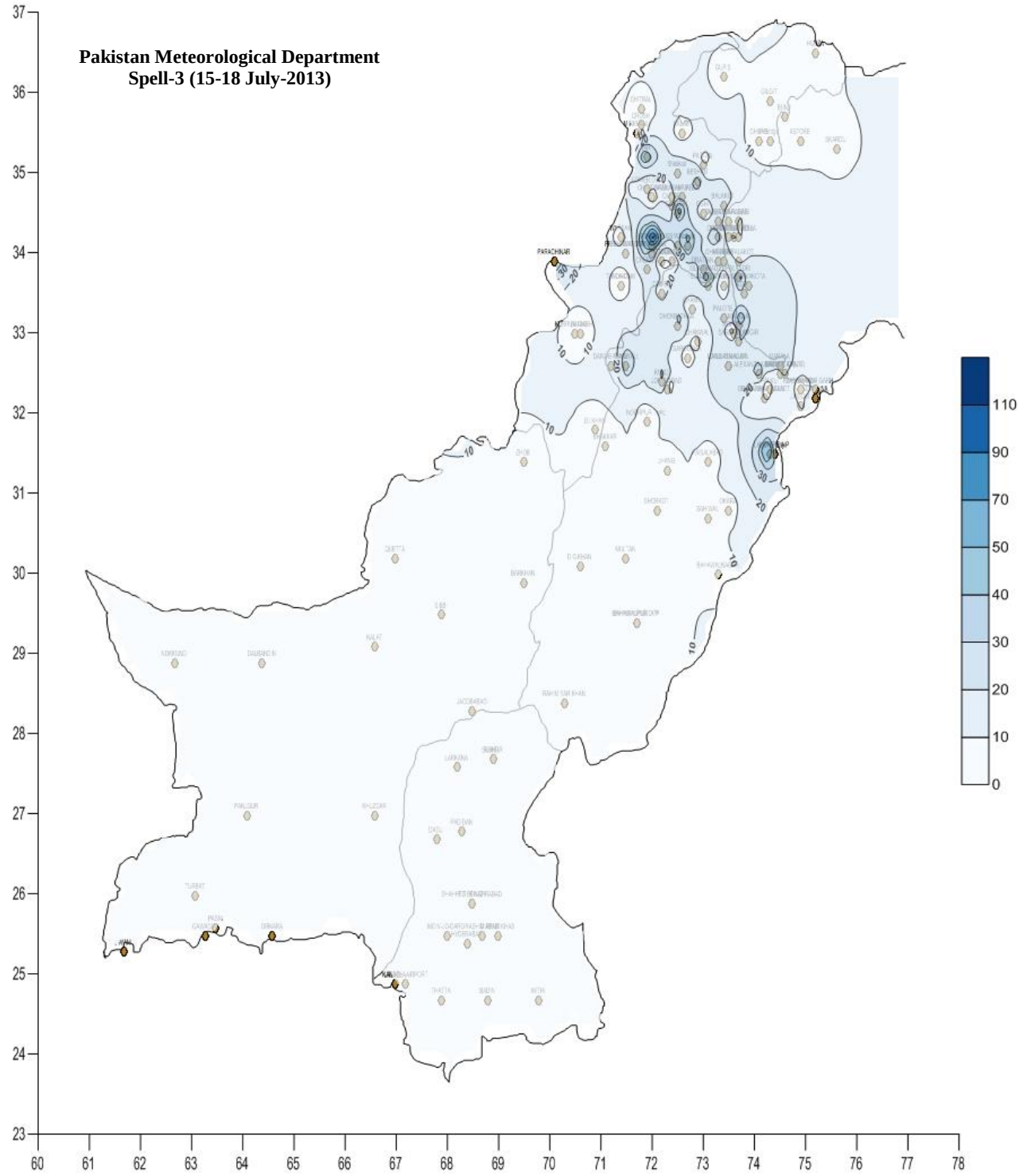
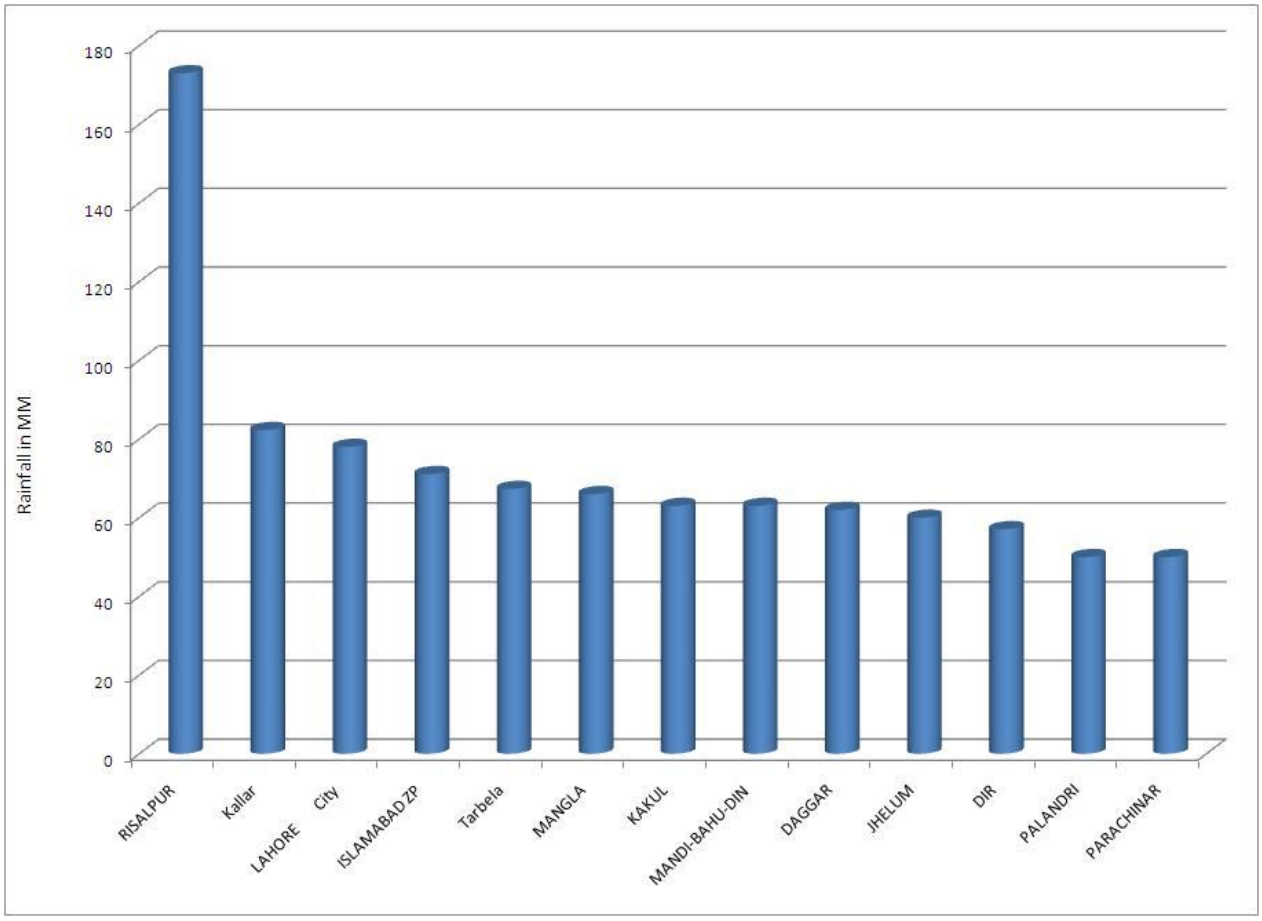


Figure 4: Wet spell of July-2013(15-18 July)

Significant rainfall more than 50 mm is shown below.



4.1.4 Rivers Position Due to the Spell:

River Kabul at Nowshehra attained the state of Low flood level during the period while all the other major rivers remained below Low flood level.

4.1.5 Third Wet Spell of July 2013 (20-07-2013 to 21-07-2013):

This spell lasted for 2 days. The rainfall of moderate to heavy intensity was recorded over northeast Punjab and Kashmir along with upper catchments of river Indus as shown below;

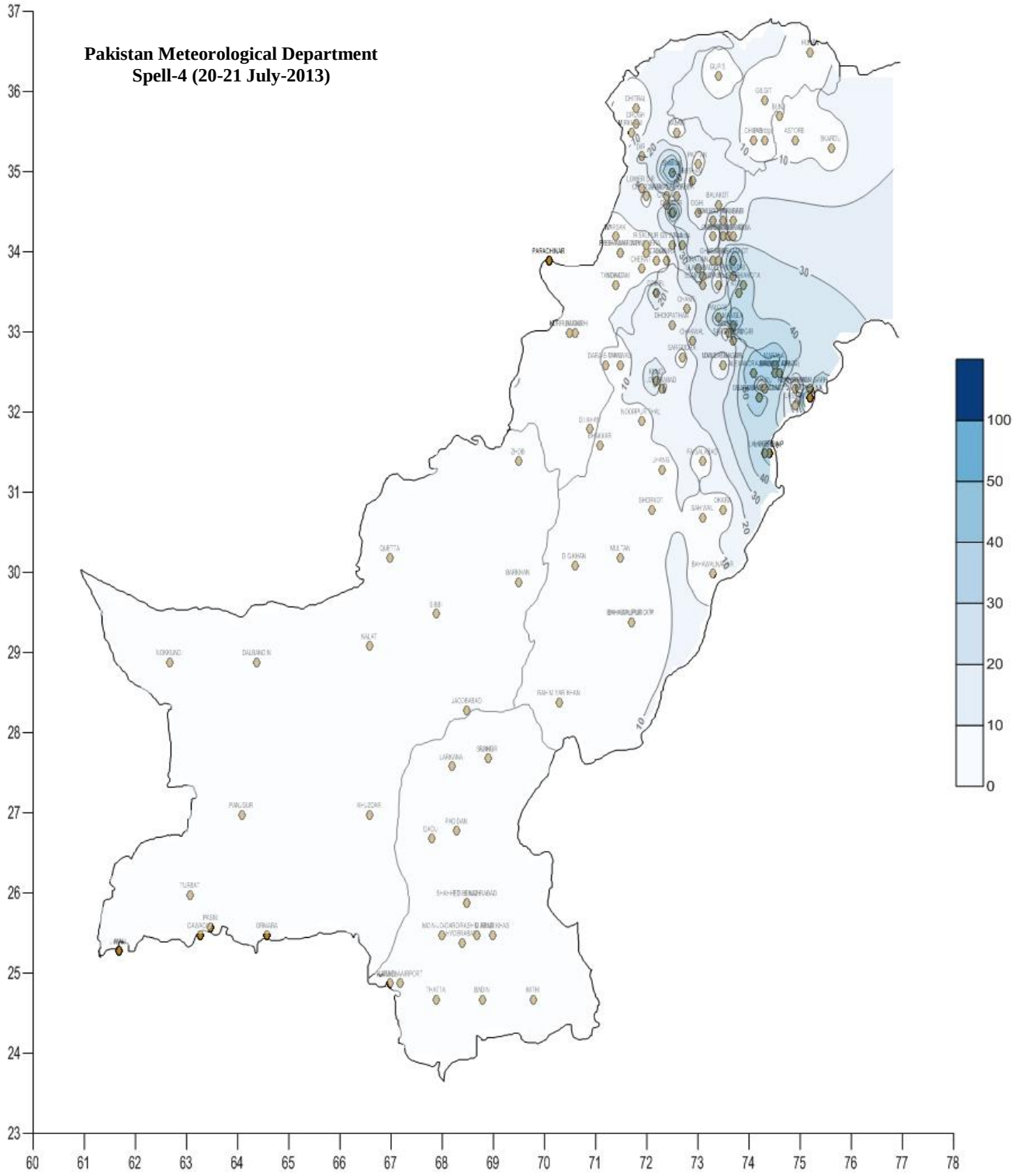
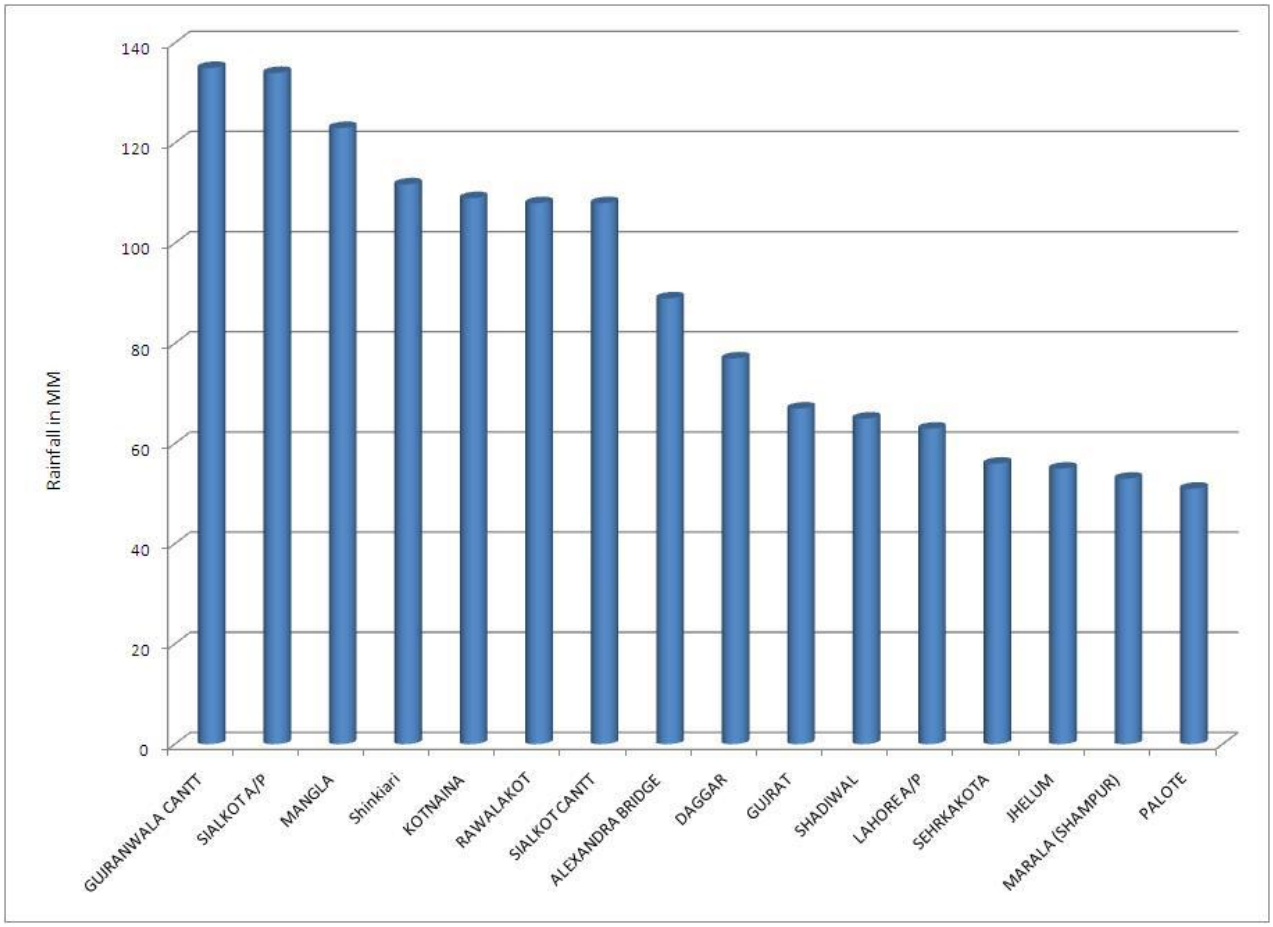


Figure 5: Wet spell of July-2013(20-21 July)

Significant rainfall more than 50 mm is shown below.



4.1.6 Rivers Position Due to 3rd Spell:

River Kabul at Nowshehra and river Chenab at Marala (upstream) attained Low flood situation.

4.1.7 Fourth Wet Spell of July 2013 (24-07-2013 to 26-07-2013):

This spell remained for 3 days. The rainfall of moderate intensity was recorded over Punjab and Kashmir along with upper catchments of river Indus as shown below:

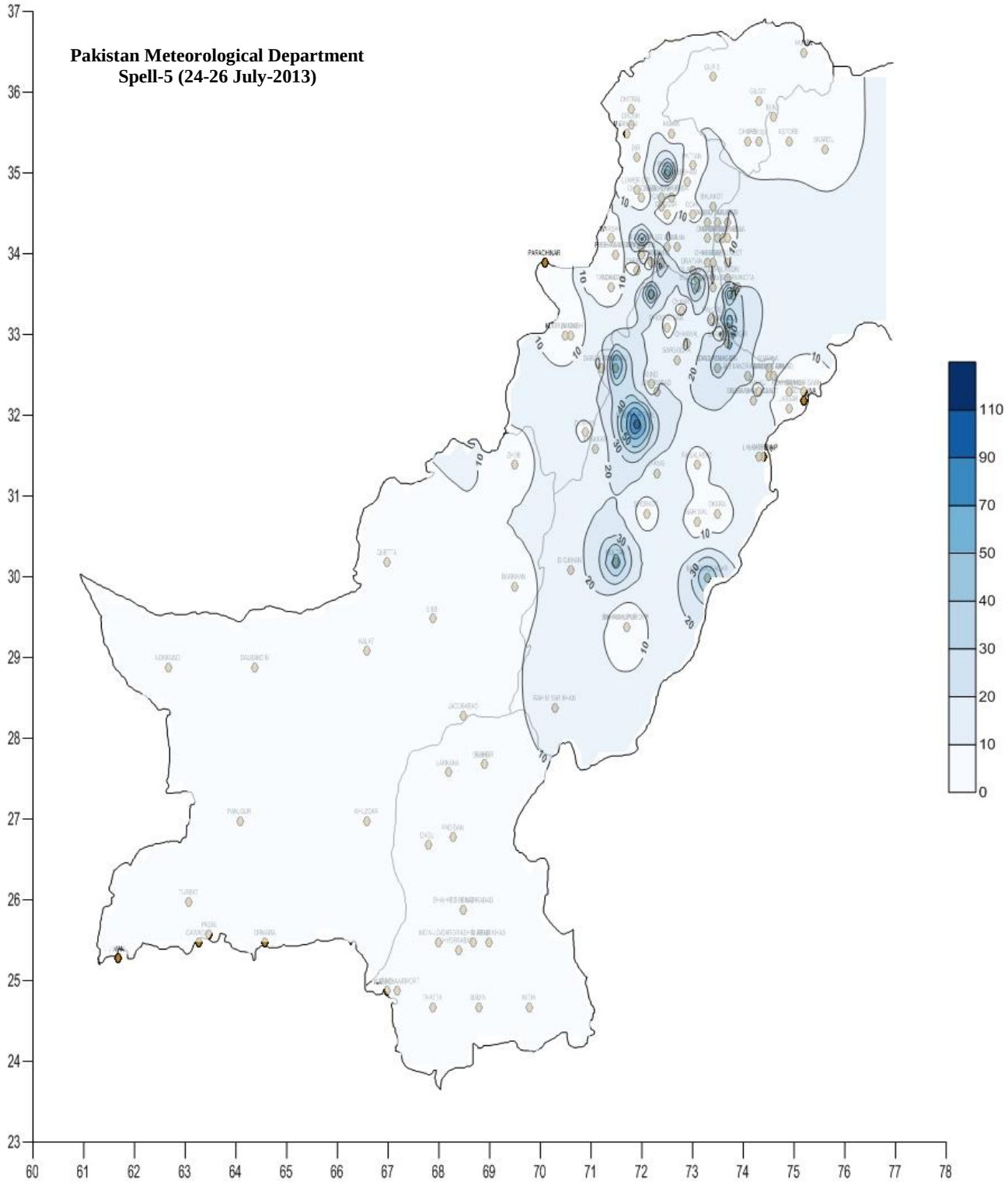
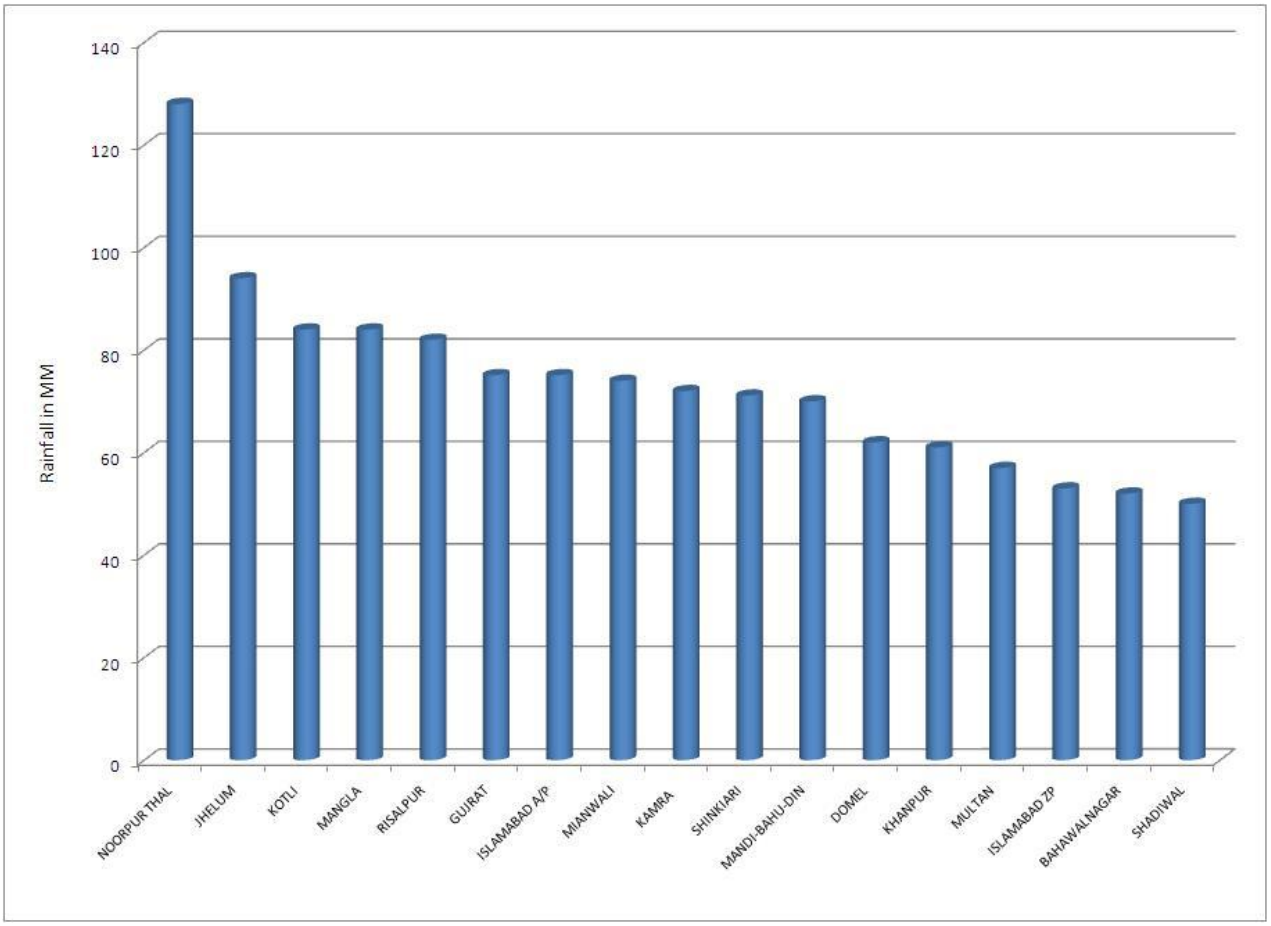


Figure 6: Wet spell of July-2013(24-26 July)

Significant rainfall more than 50 mm is shown below.



4.1.8 Rivers Position Due to 4th Spell:

River Indus at Chashma (upstream) attained Medium flood level, Low flood at Kalabagh and river Jhelum at Mangla attained Low flood situation.

4.1.9 Rainfall Pattern for the Month of July, 2013:

Isohyetal map of July, 2013 indicates that one maxima of rainfall (More than 400 mm) lye over Risalpur and the other (More than 300 mm) lye over northeast Punjab and Kashmir as shown below.

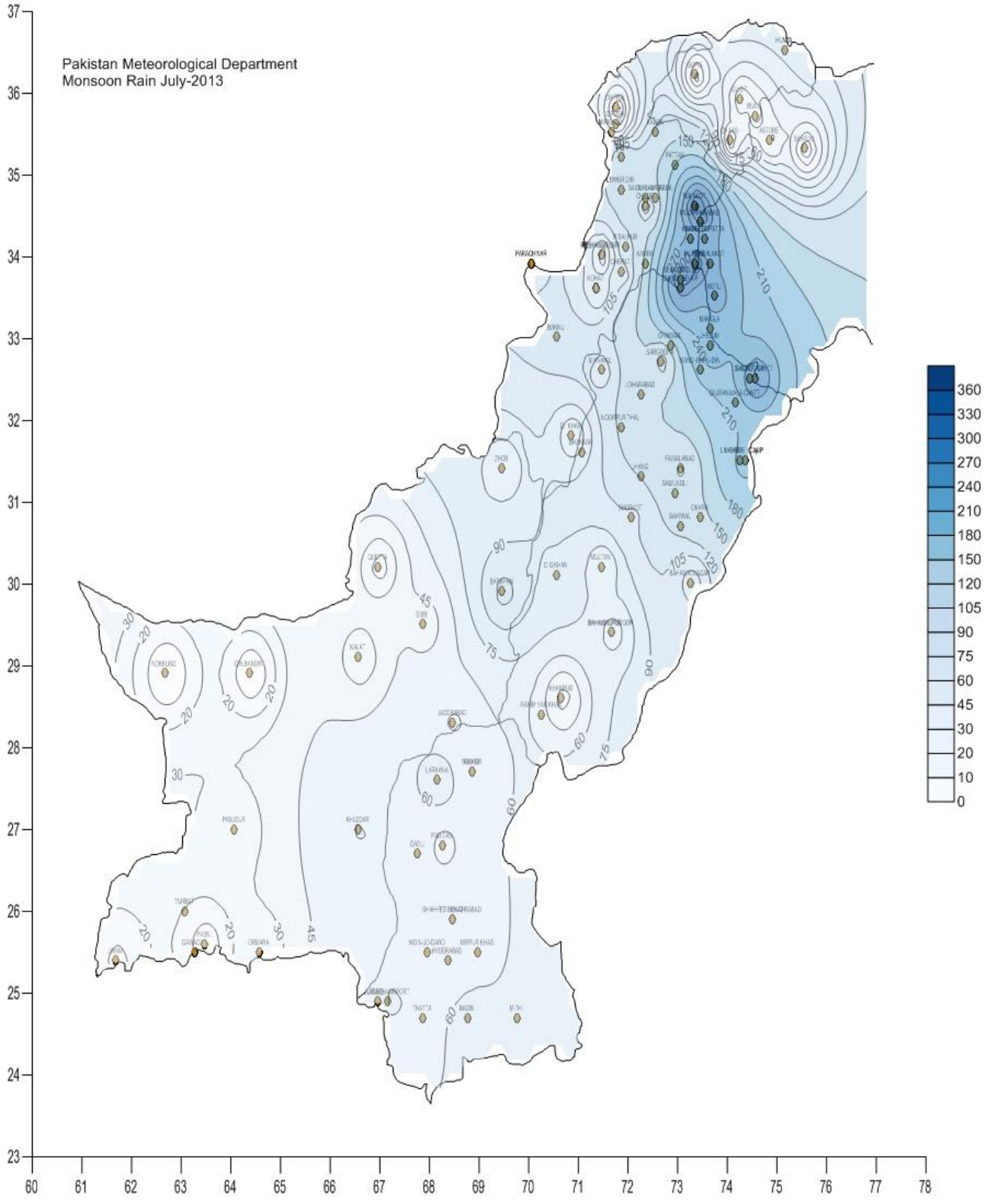


Figure 7: (Isohyetal Map of July 2013)

4.1.10 Rivers Position during the month of July, 2013:

Date	Rivers	Station	Up-stream (Cusecs)	Flood level
25/7/2013	INDUS	Chashma	456164	Medium
22/7/2013	RAVI	Shahdara	40780	Low
8/7/2013	JHELUM	Mangla	83600	Low
24/7/2013	JHELUM	Mangla	89000	Low
30/7/2013	JHELUM	Mangla	180000	High
20/7/2013	CHENAB	Marala	130447	Medium
24/7/2013	CHENAB	Marala	105424	Low
30/7/2013	CHENAB	Marala	150871	Medium
30/7/2013	CHENAB	Khanki	132162	Low
31/7/2013	CHENAB	Qadirabad	120449	Low
9/7/2013	INDUS	Tarbela	257000	Low
23/7/2013	INDUS	Tarbela	295000	Low
10/7/2013	INDUS	Kalabagh	299066	Low
24/7/2013	INDUS	Kalabagh	360112	Low
27/7/2013	INDUS	Taunsa	348296	Low
31/7/2013	INDUS	Guddu	316176	Low

Hydrographs recorded during the month of July,2013 are as below:

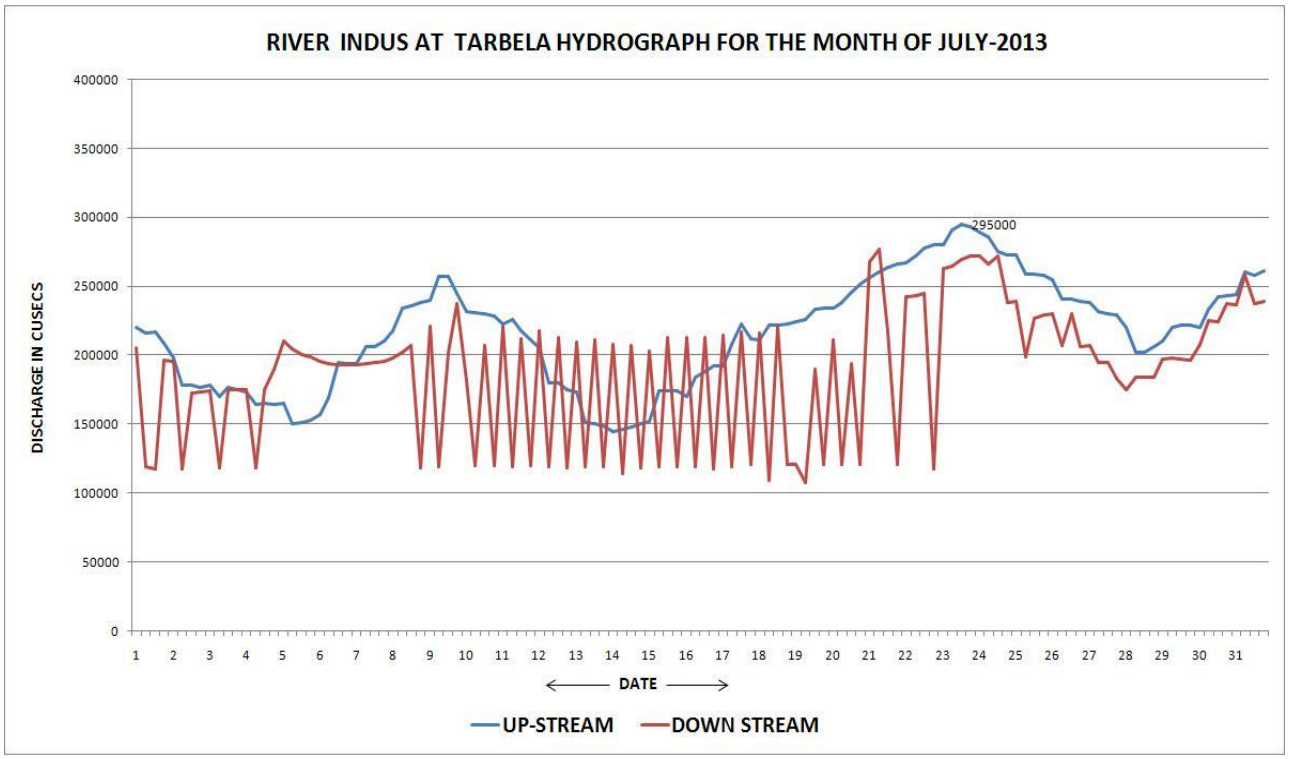


Figure 8: Hydrograph (River Indus at Tarbela July 2013)

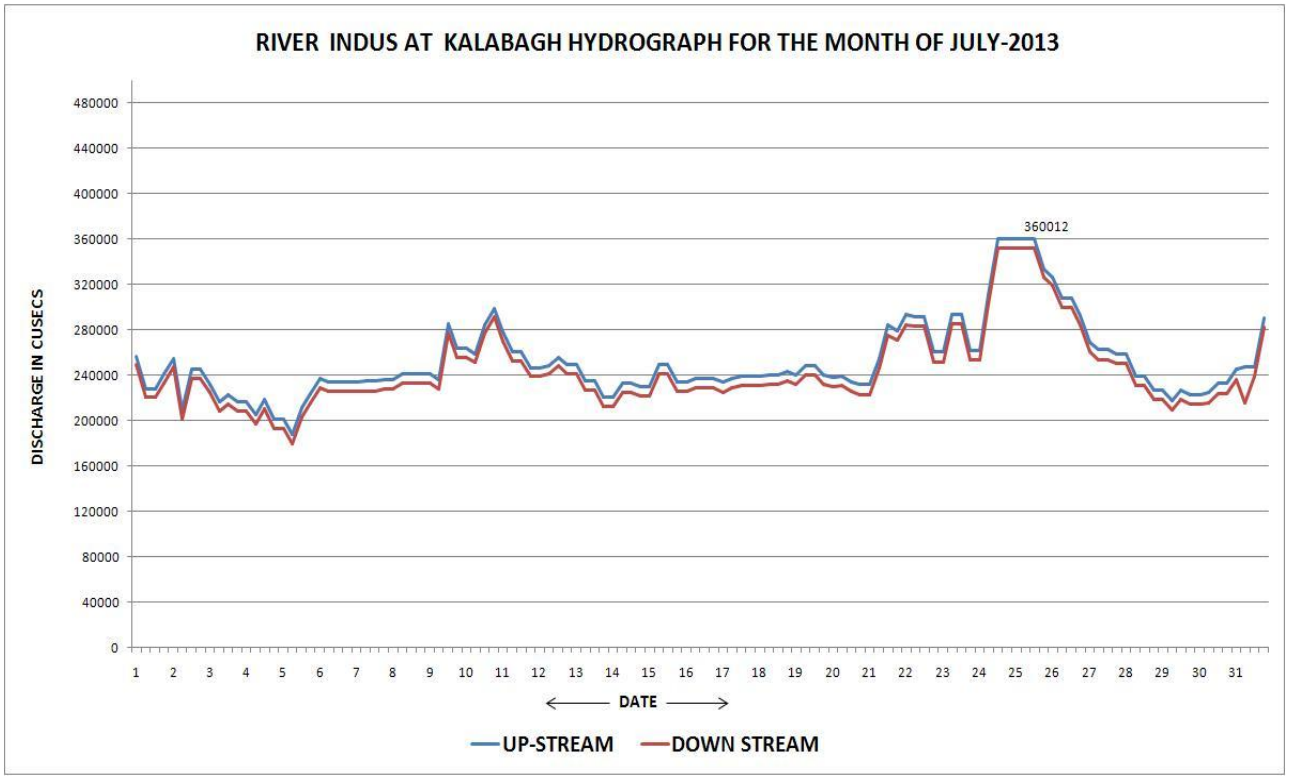


Figure9: Hydrograph (River Indus at Kalabagh July 2013)

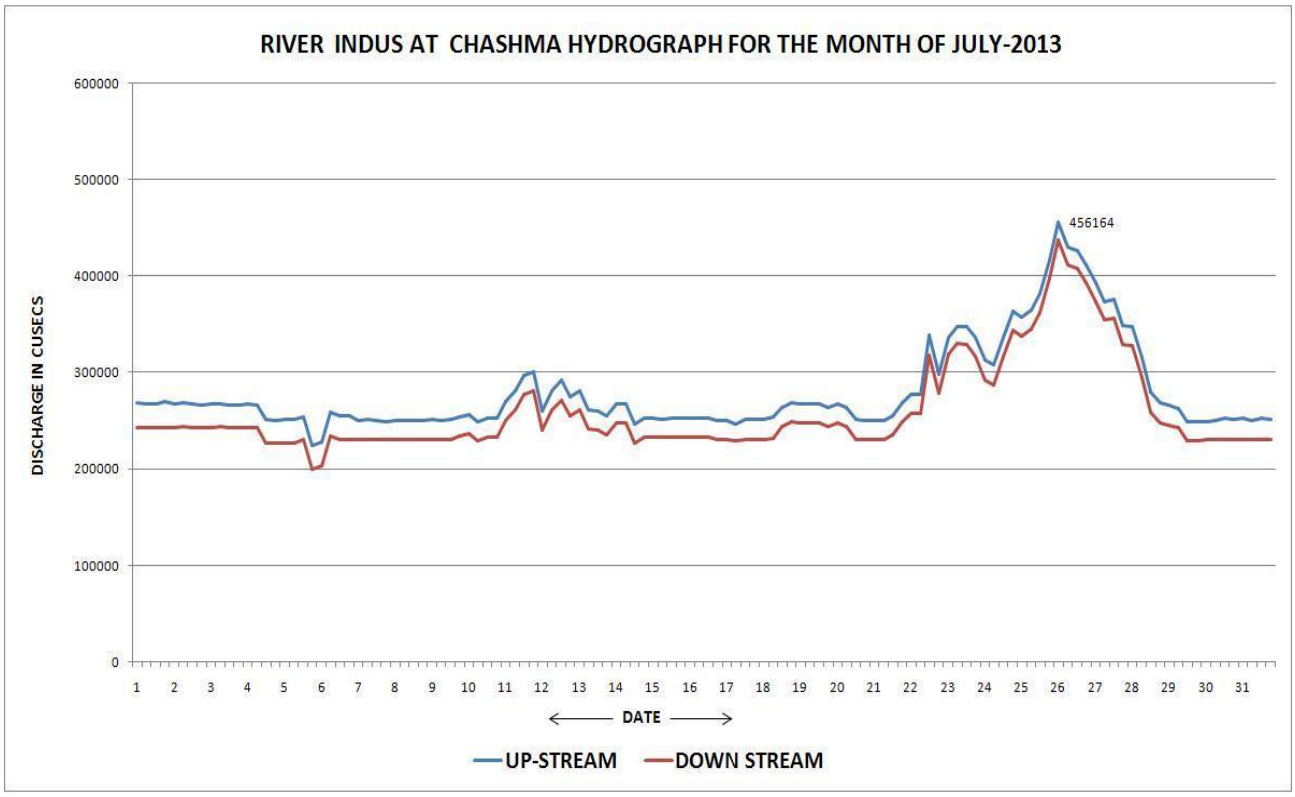


Figure 10: Hydrograph (River Indus at Chashma July 2013)

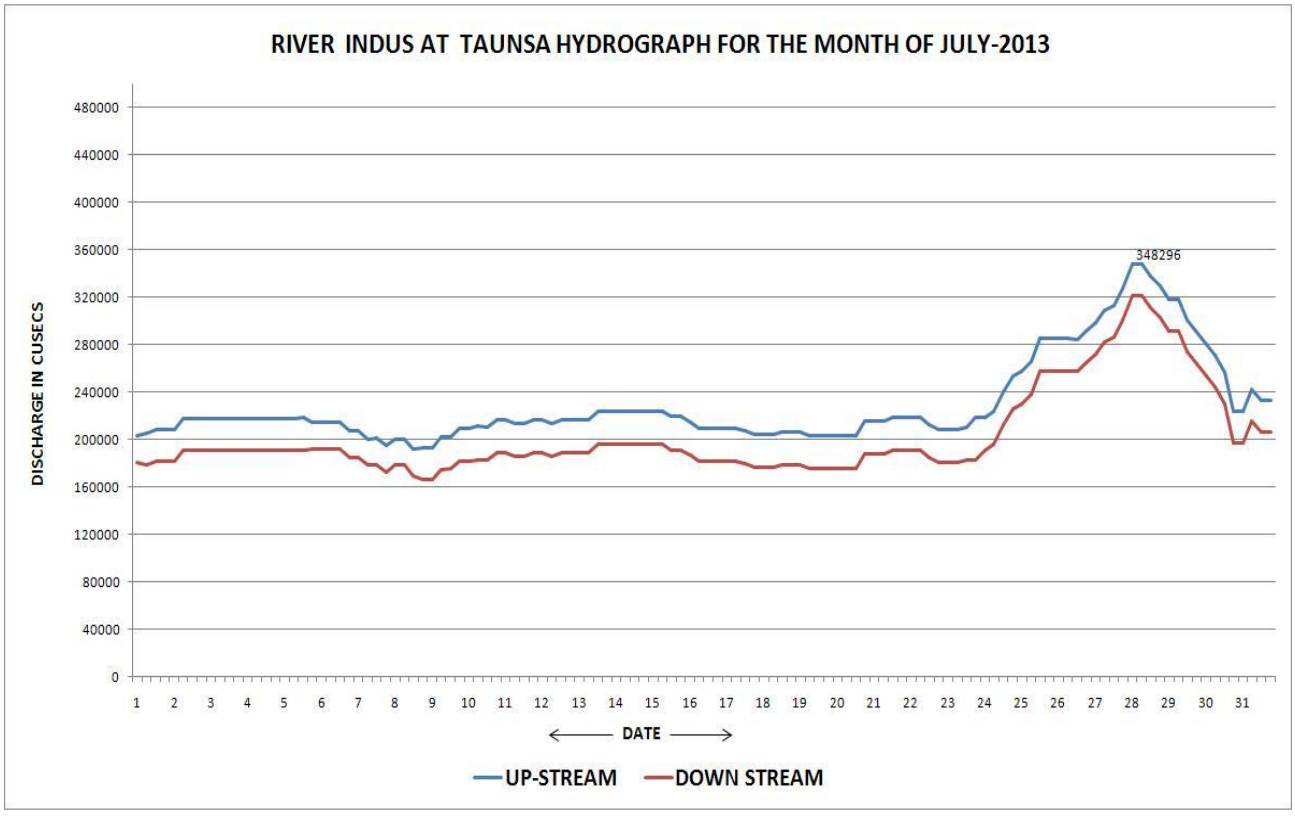


Figure11: Hydrograph (River Indus at Taunsa July 2013)

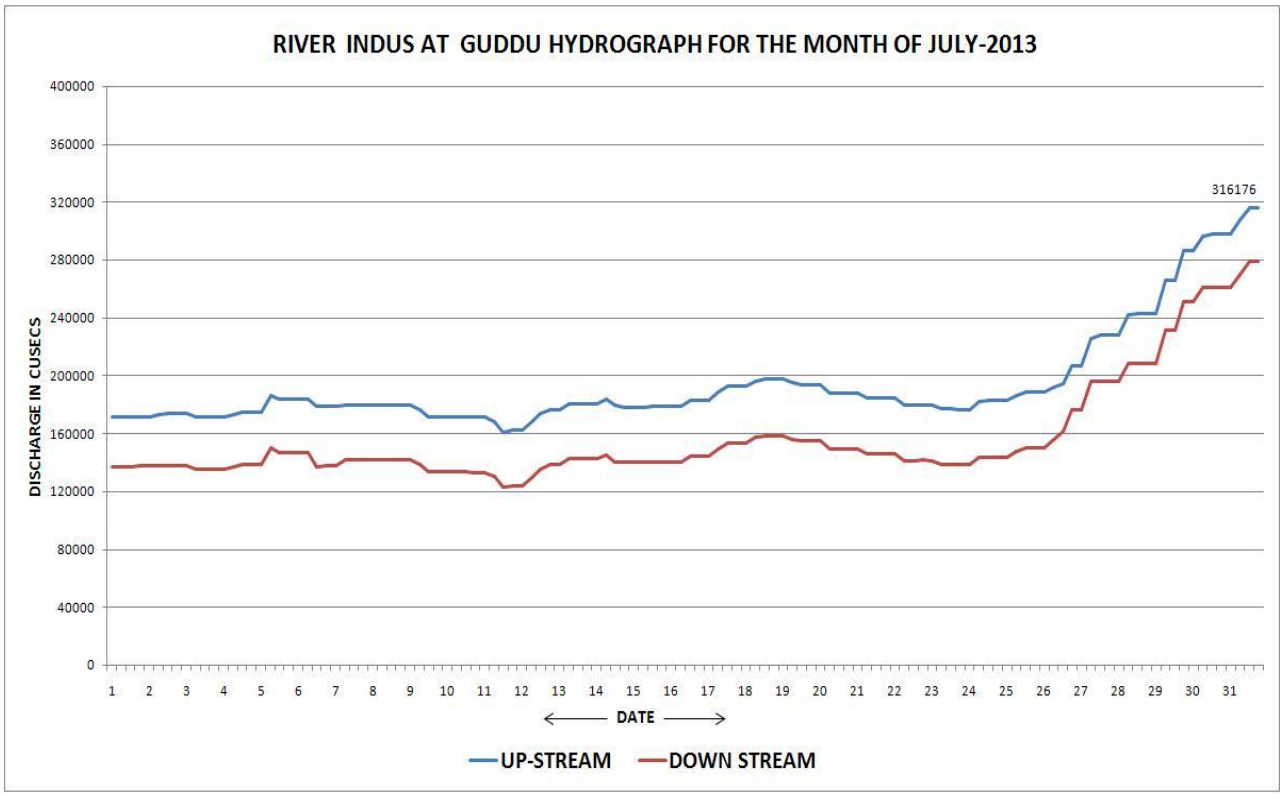


Figure12: Hydrograph (River Indus at Guddu July 2013)

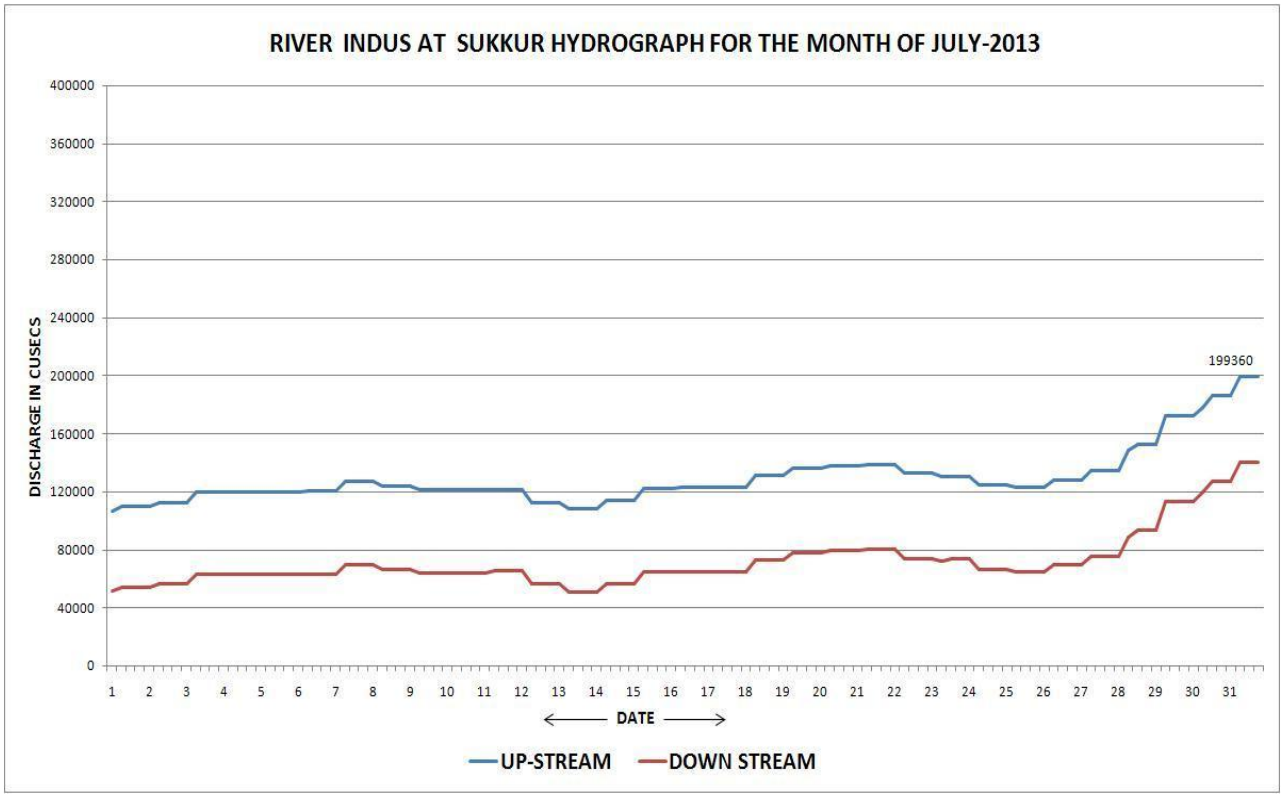


Figure 13: Hydrograph (River Indus at Sukkur July 2013)

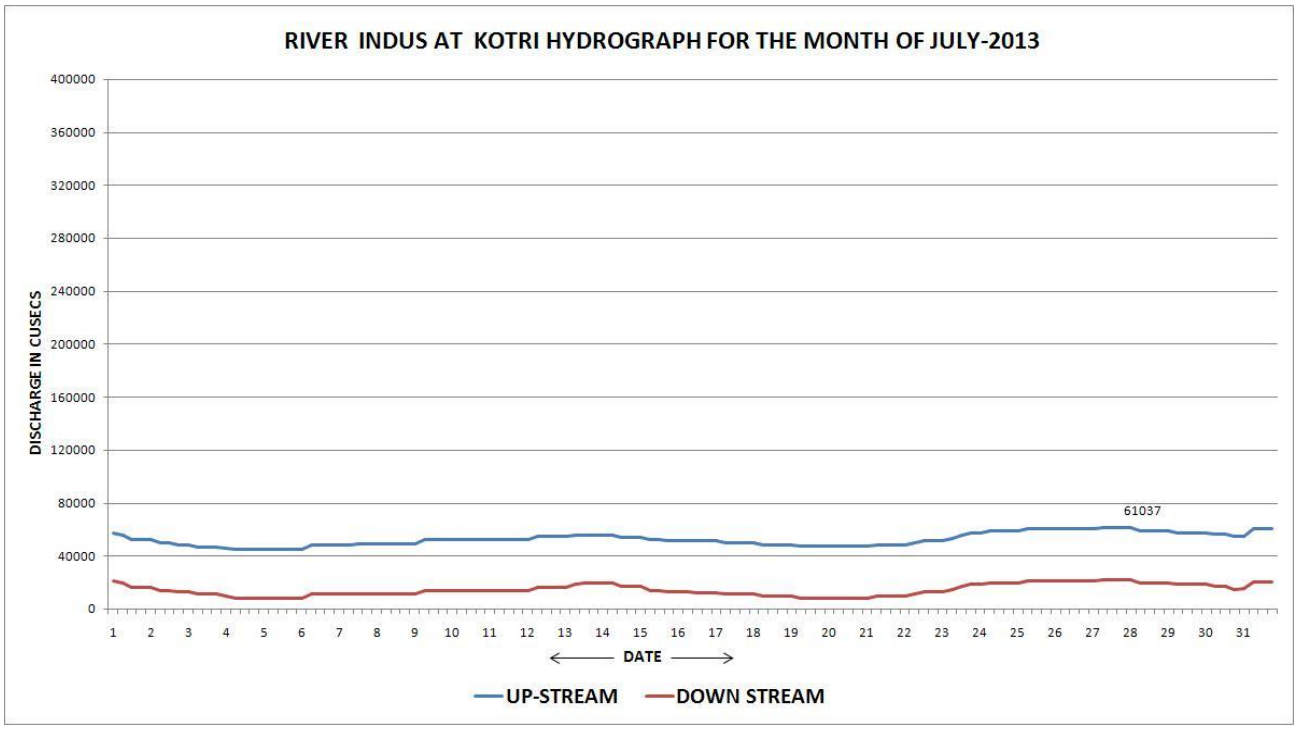


Figure 14: Hydrograph (River Indus at Kotri July 2013)

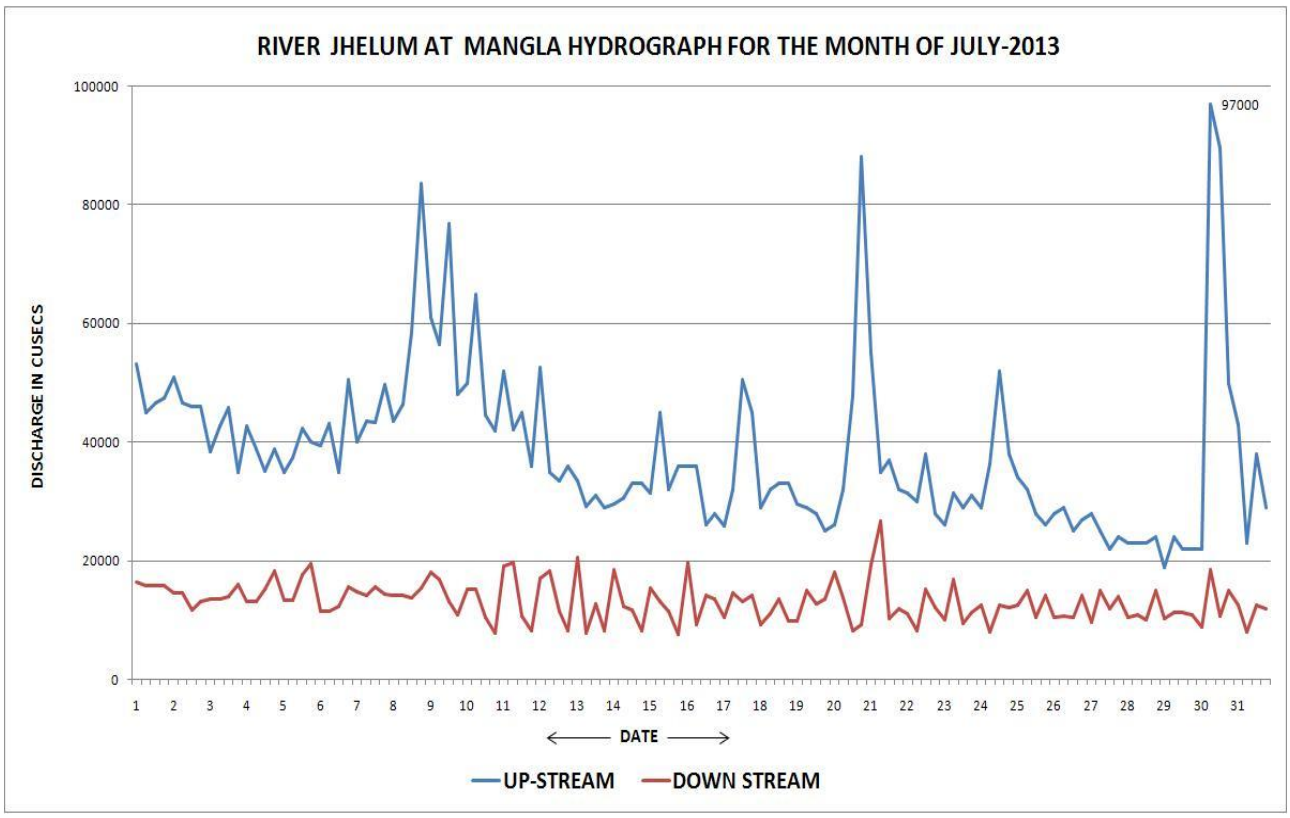


Figure 15: Hydrograph (River Jhelum at Mangla July 2013)

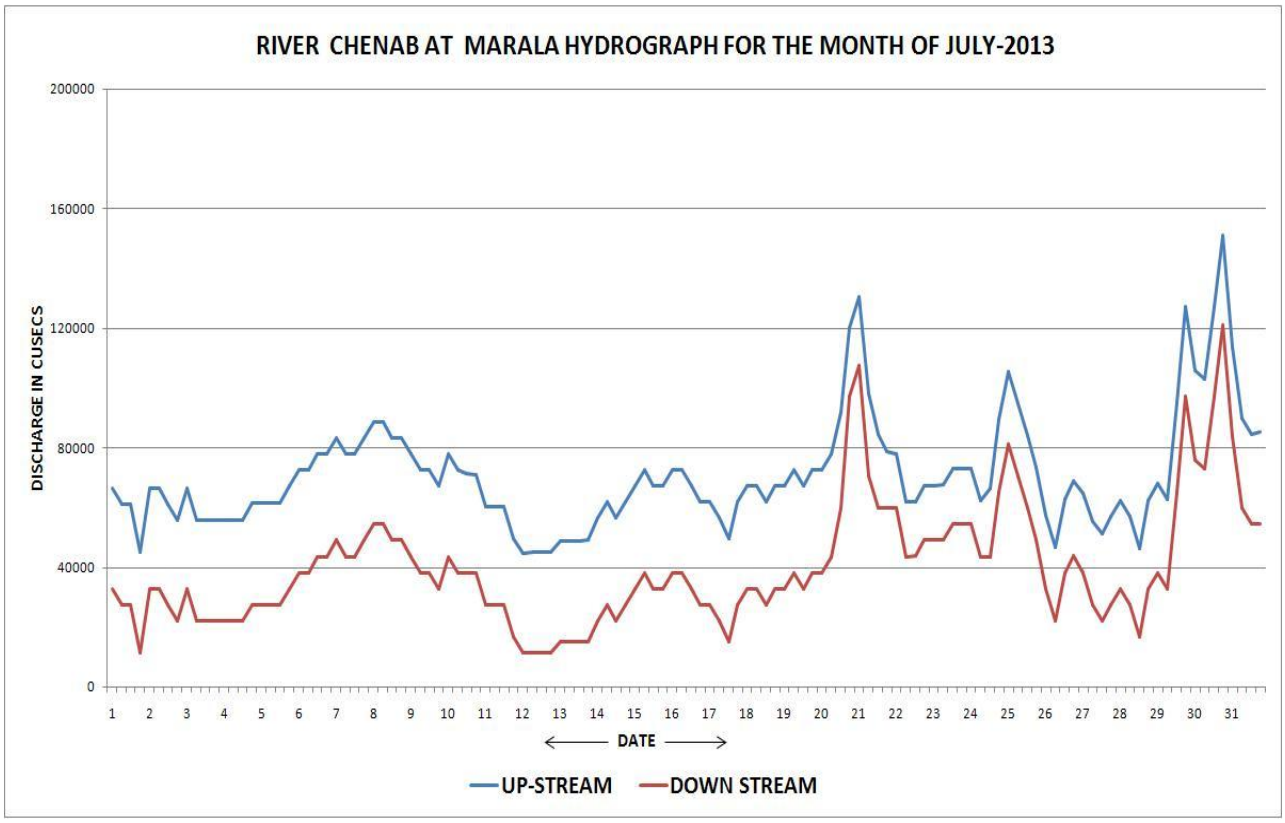


Figure16: Hydrograph (River Chenab at Marala July 2013)

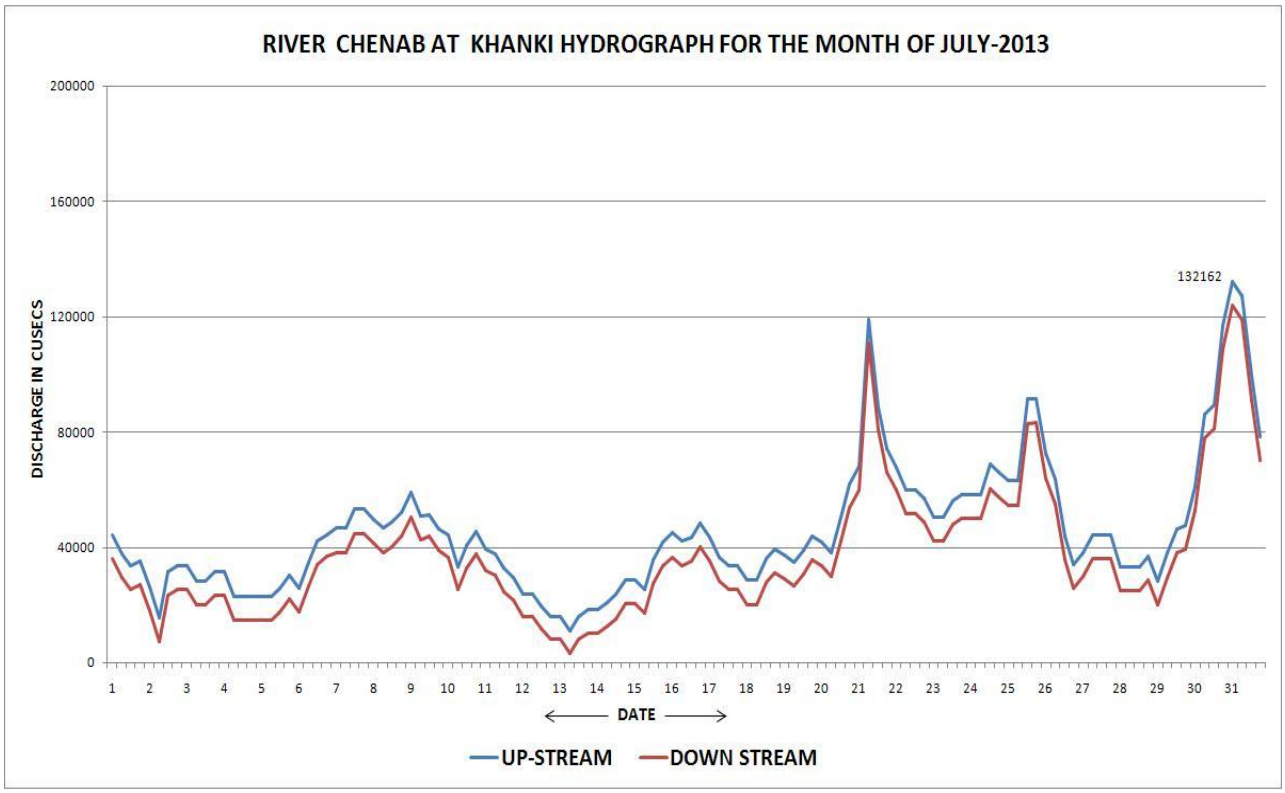


Figure17: *Hydrograph (River Chenab at Khanki July 2013)*

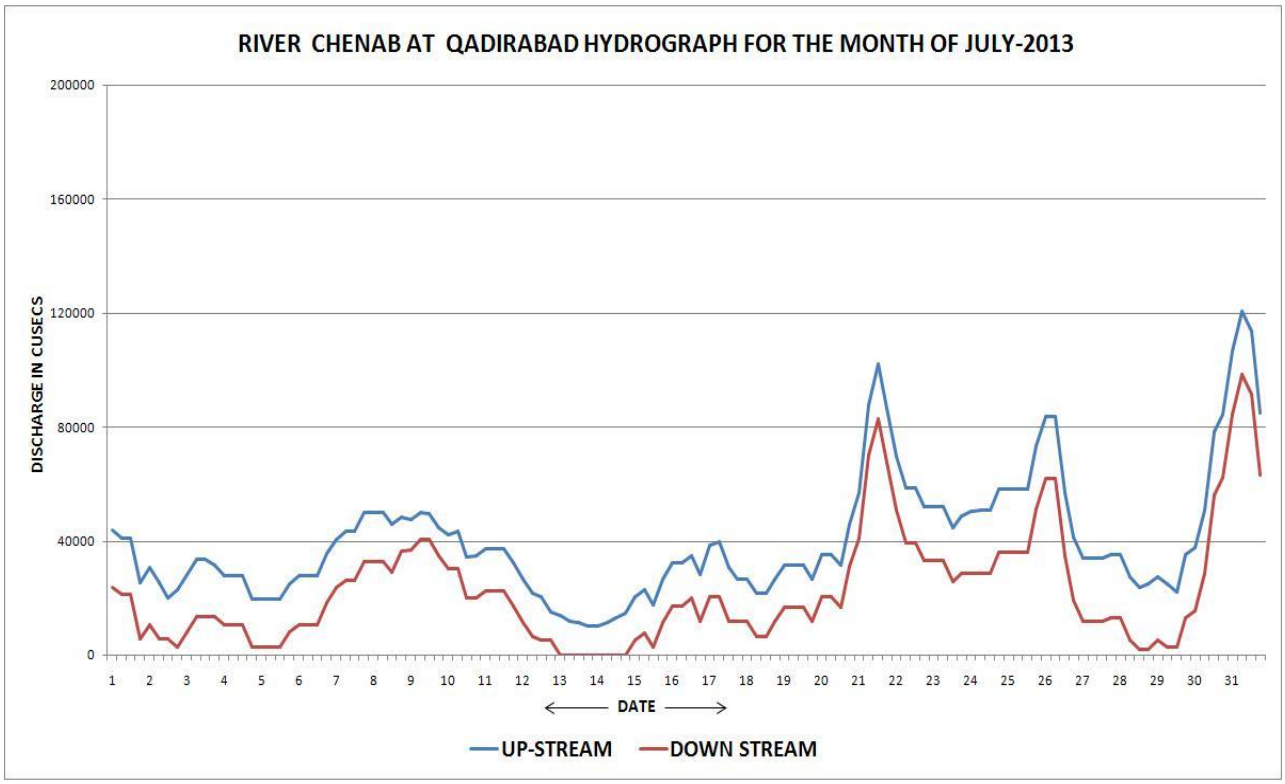


Figure 18: *Hydrograph (River Chenab at Qadirabad July 2013)*

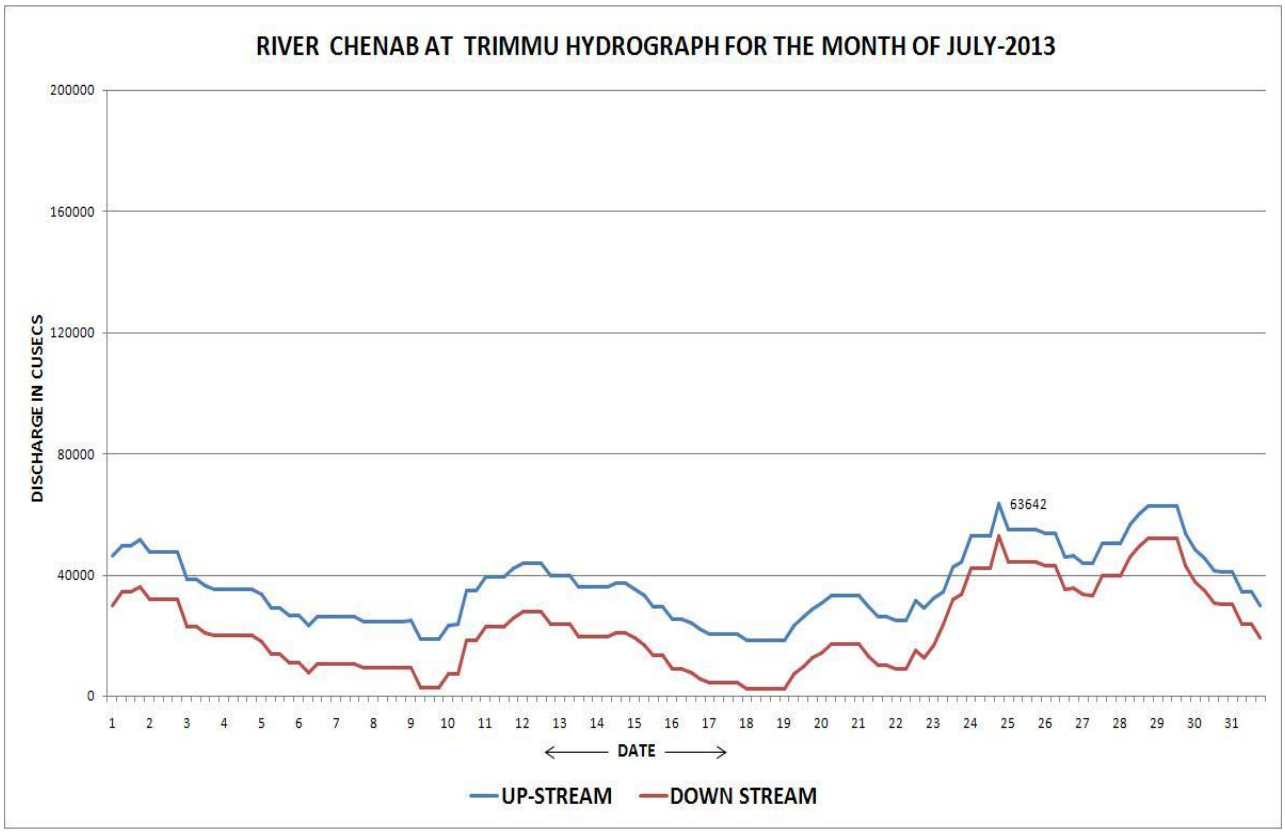


Figure 19: *Hydrograph (River Chenab at Trimmu July 2013)*

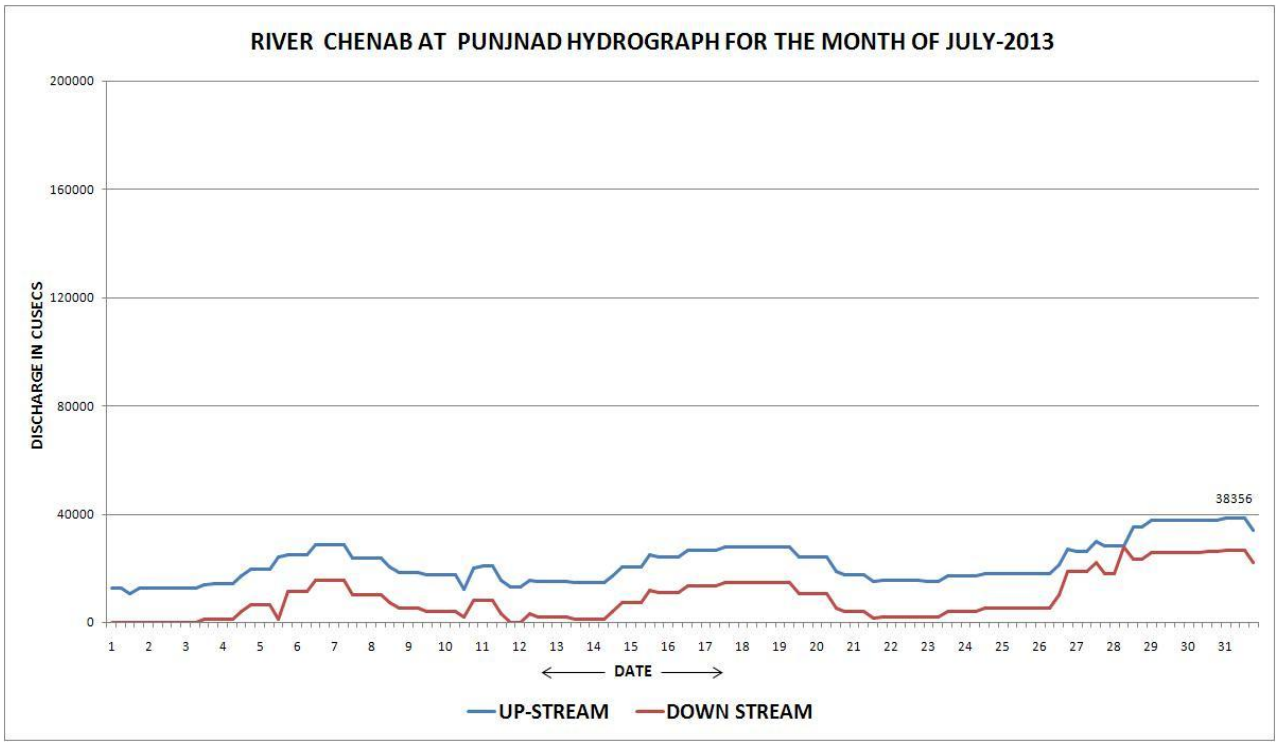


Figure 20: *Hydrograph (River Chenab at Punjnad July 2013)*

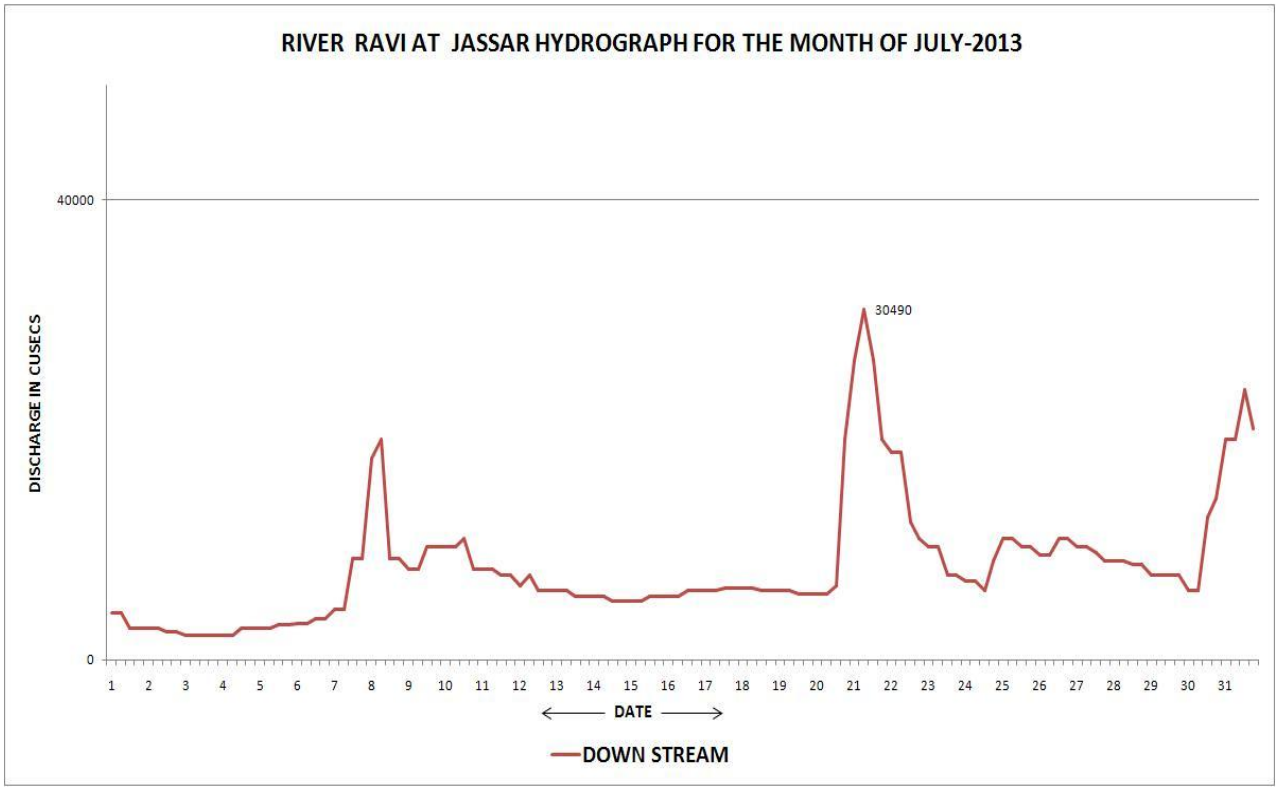


Figure 21: *Hydrograph (River Ravi at Jassar July 2013)*

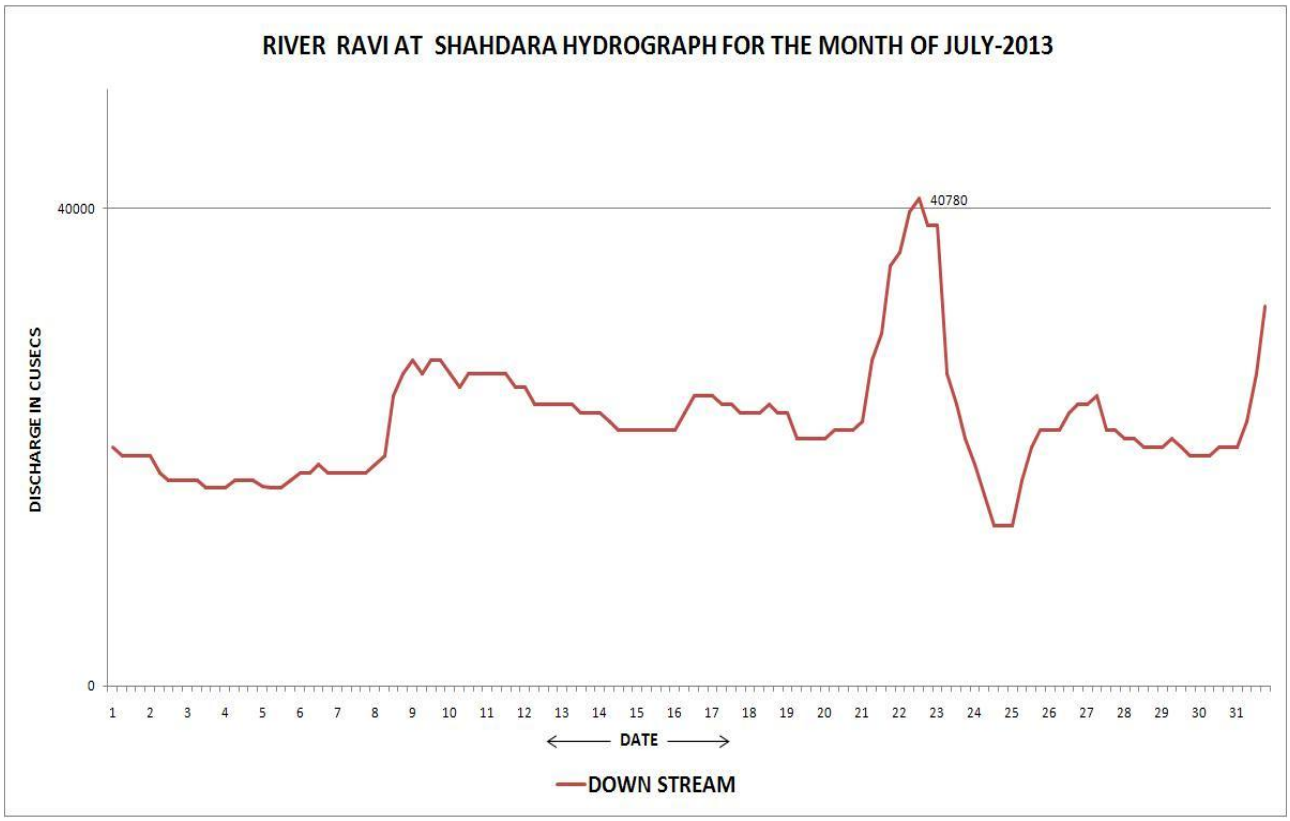


Figure22: *Hydrograph (River Ravi at Shahdara July 2013)*

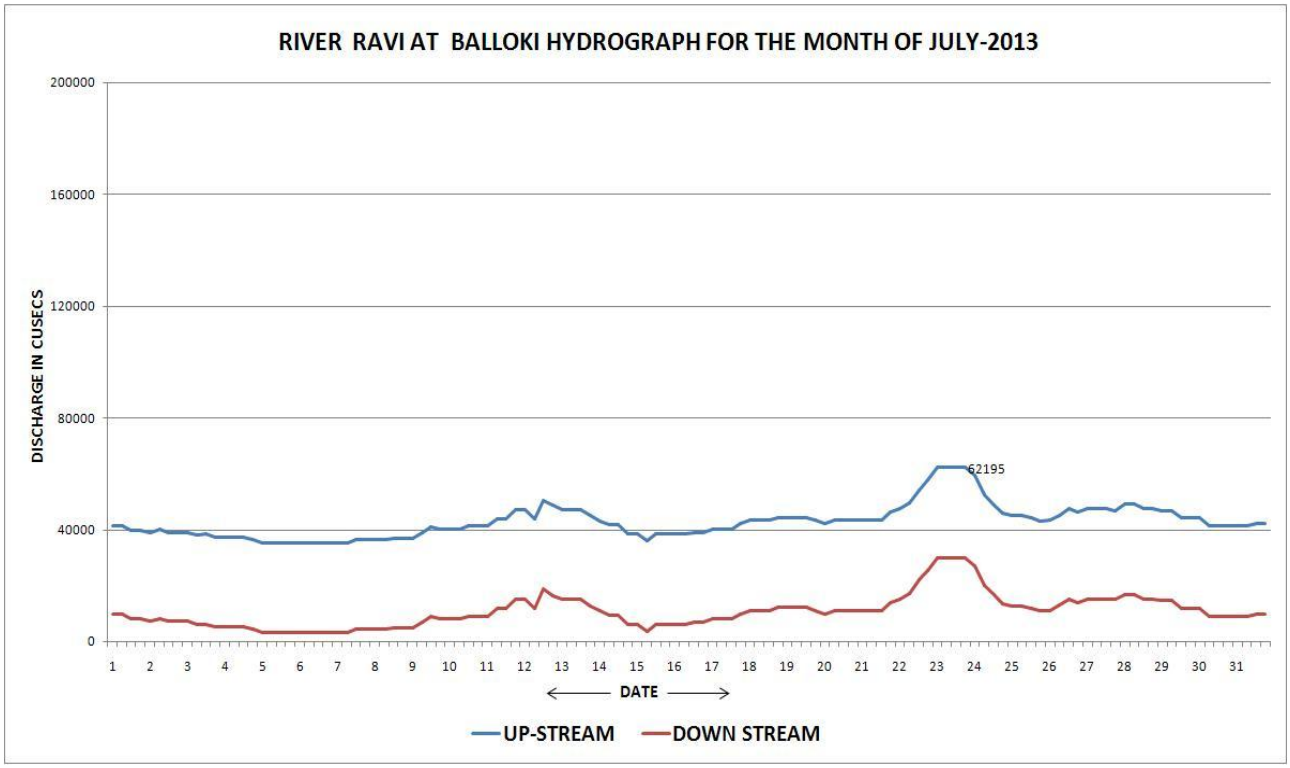


Figure 23: *Hydrograph (River Ravi at Balloki July 2013)*

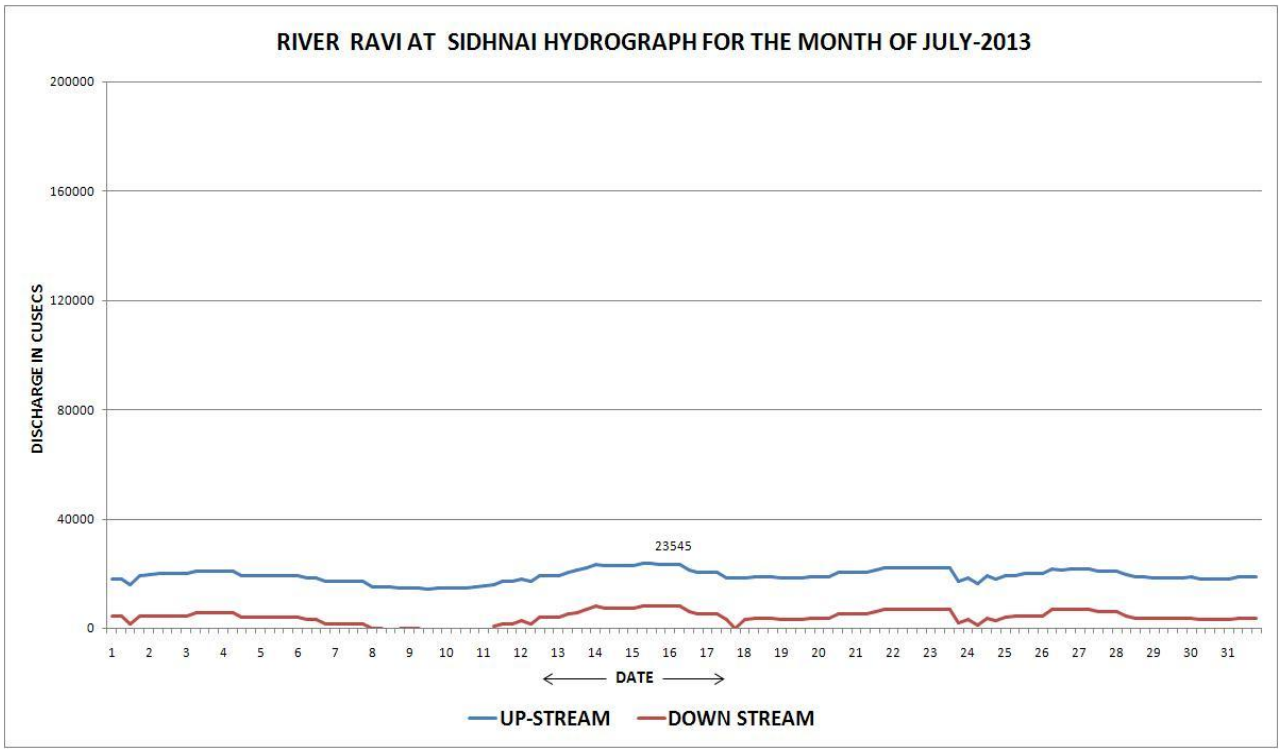


Figure24: *Hydrograph (River Ravi at Sidhnai July 2013)*

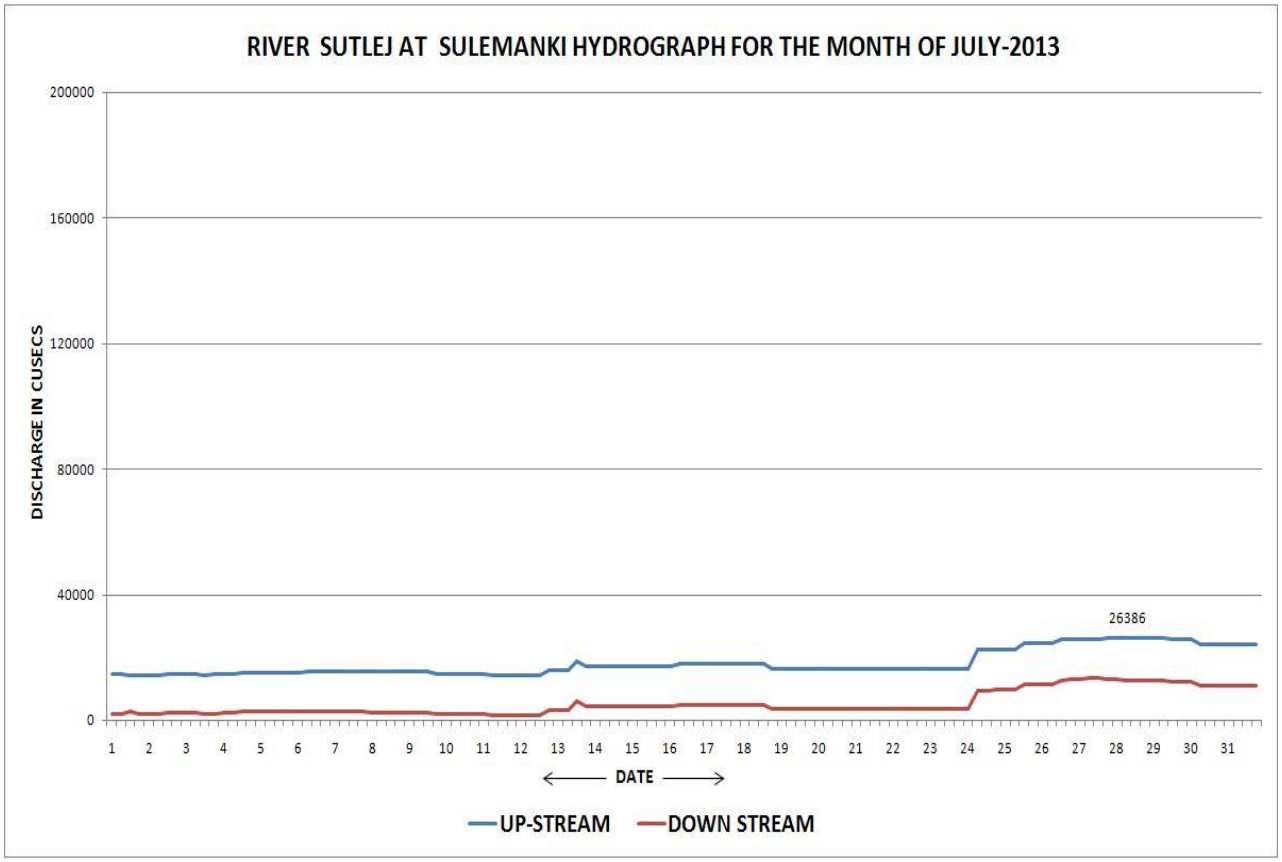


Figure 25: *Hydrograph (River Sutlej at Sulemanki July 2013)*

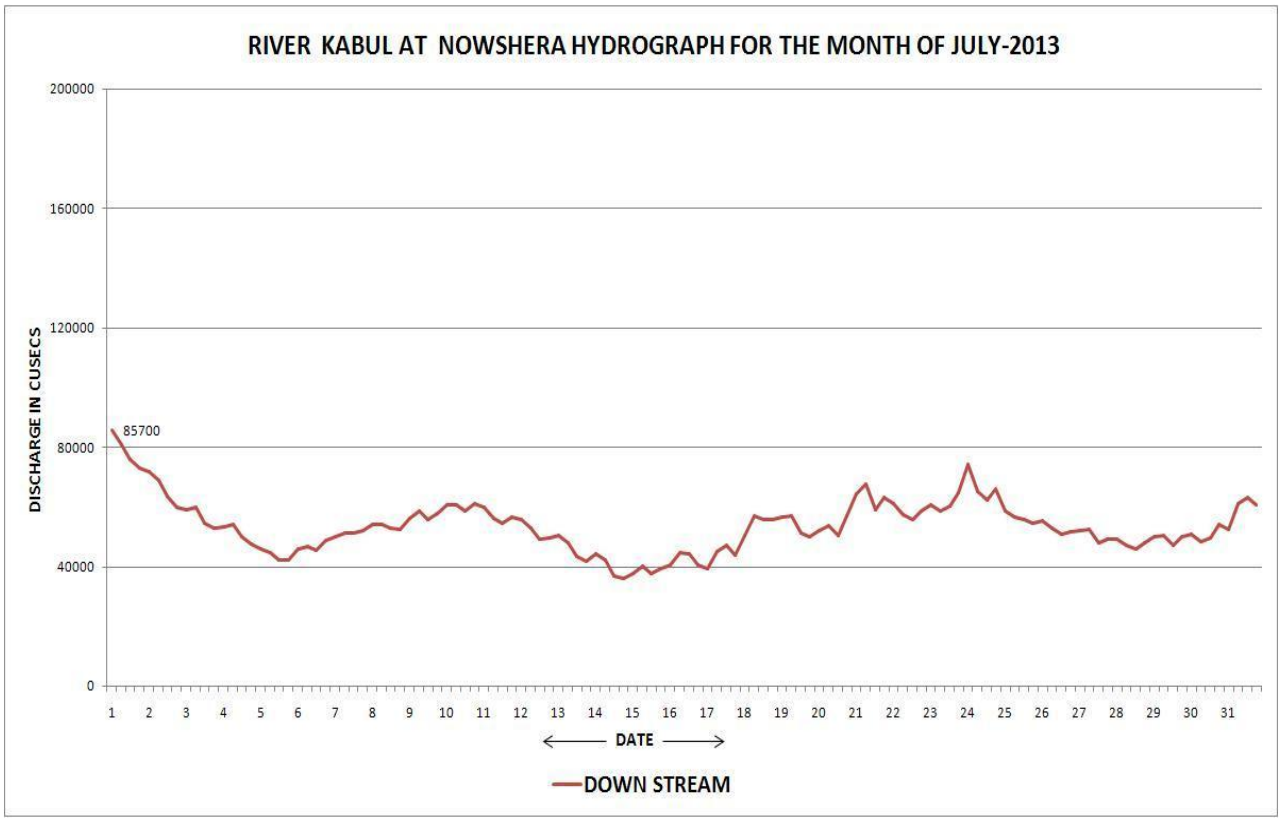


Figure 26: *Hydrograph (River Kabul at Nowshehra July 2013)*

5 Significant Hydro-Meteorological Events during the month of August 2013:

5.1 Meteorological Events:

Five heavy and very heavy rainy spells occurred during the month of August. First spell occurred from 3rd to 4th August 2013. This spell was caused by the interaction of trough of westerly wave, accentuation of seasonal low, presence of monsoon low over southeast Rajasthan and moist current from the Arabian Sea and Bay of Bengal. Second wet spell of the August observed from 6th to 8th August 2013. This spell was also caused by the interaction of a trough of westerly wave, accentuation of seasonal low and moist current from the Arabian Sea and Bay of Bengal. Third spell occurred from 10th to 15th August 2013. This spell caused monsoon low over Rajasthan and adjoining Bahawalpur Division and the passage of westerly wave alongwith accentuation of seasonal low. Fourth spell of August recorded from 18th to 19th August, 2013was due to the interaction of a trough of westerly wave and a low over Indian Punjab. Fifth and final spell occurred from 28th to 30th August 2013 was also due to westerly wave and accentuation of seasonal low. During August three monsoon lows developed over the Bay of Bengal.

5.1.1 First Wet Spell of August (03-08-2013 to 04-08-2013):

The rainfall during the first spell of August which was 6th of the season occurred during 3rd to 4th August 2013 .Moderate to heavy Rainfall was observed in this spell over northern Sindh, Kashmir and northeast Punjab. Rainfall during the spell is shown in figure 27,

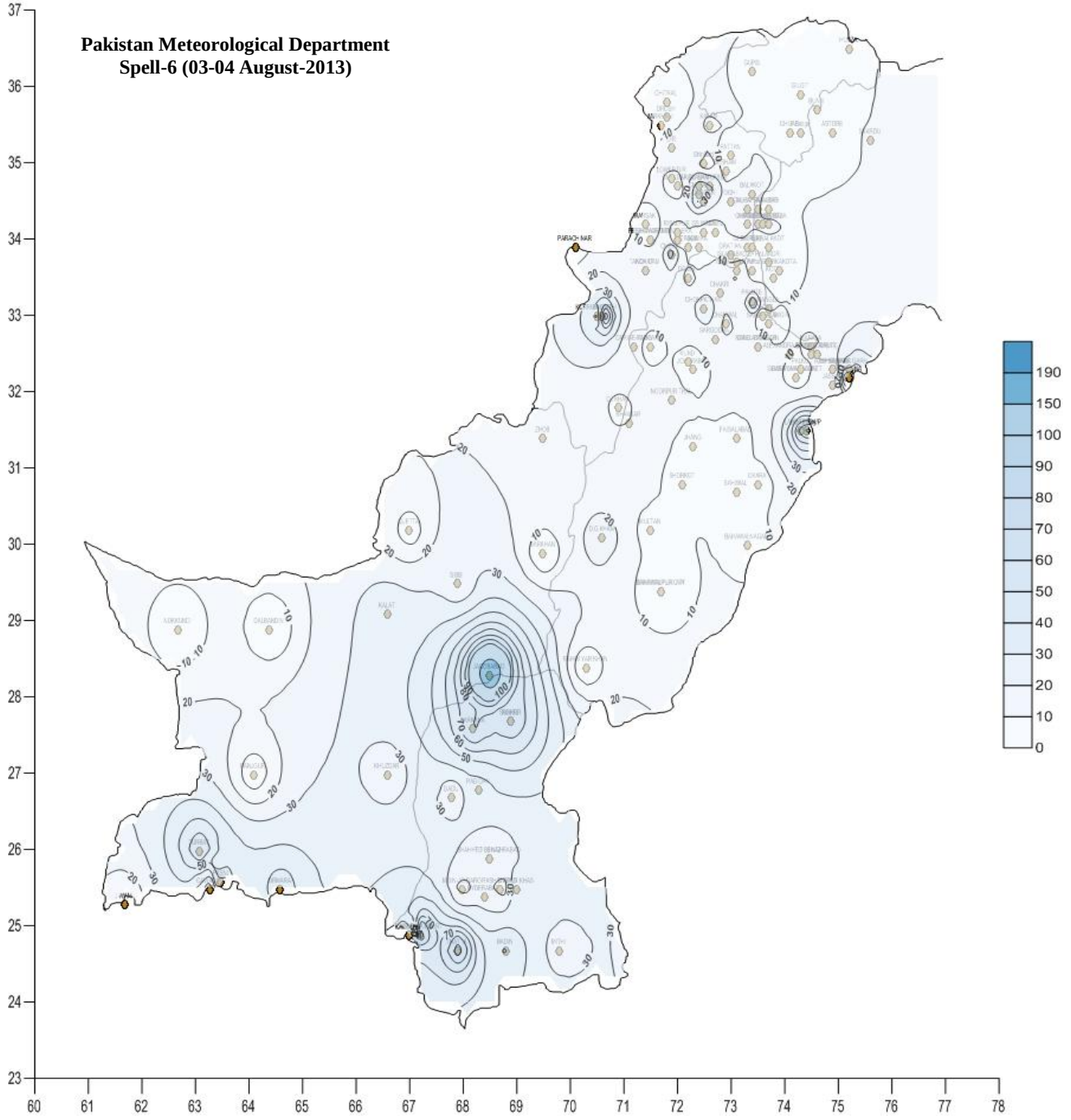
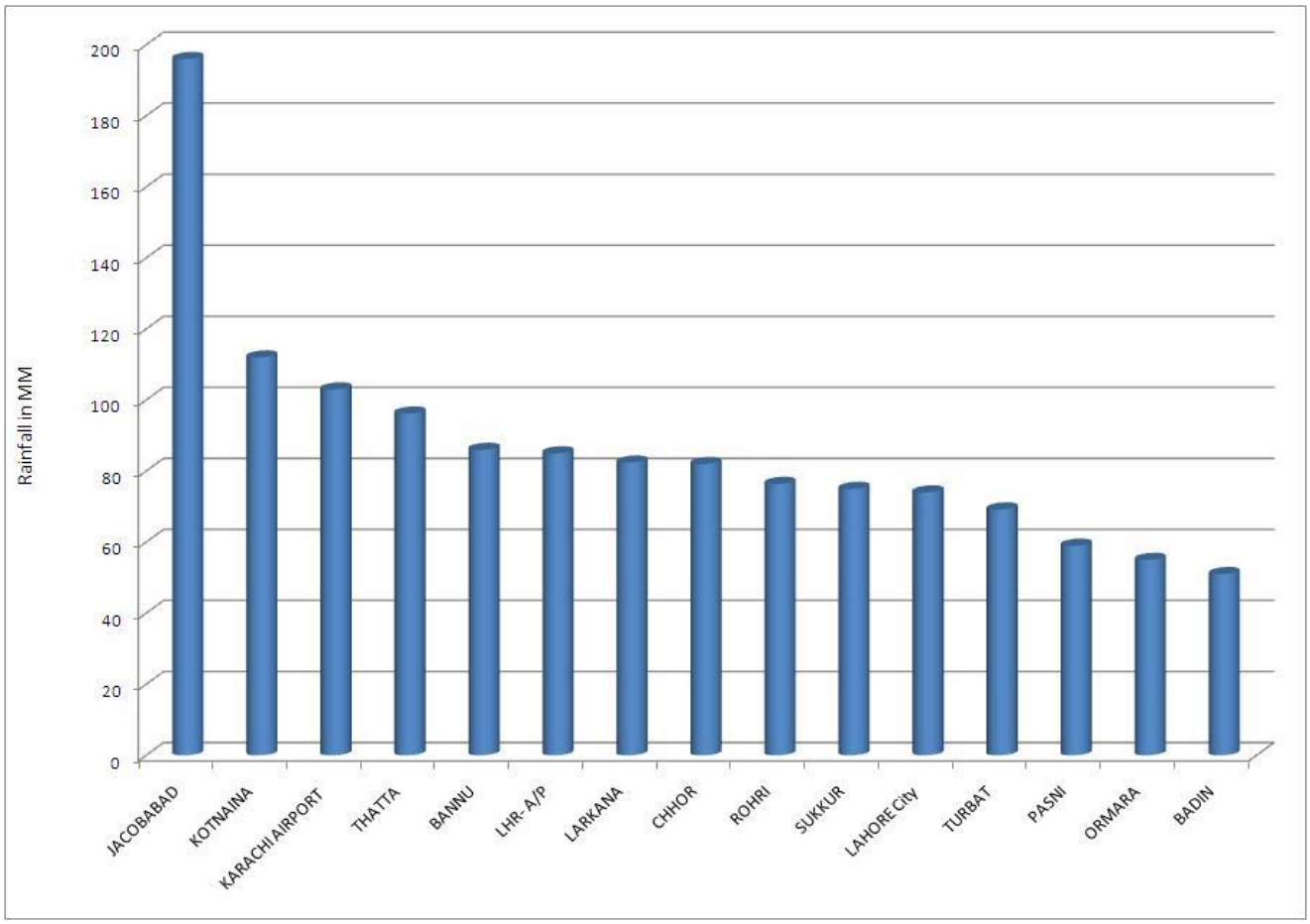


Figure 27: Wet spell of August-2013 (03-04 August)

Significant rainfall more than 50 mm is shown below.



5.1.2 Rivers Position during the Spell:

Due to this spell river Kabul at Nowshehra attained a Medium flood situation while Low flood situation was observed in river Ravi at Shahdara and High flood situation in river Indus at Chashma (Upstream).

5.1.3 Second Wet Spell of August (06-08-2013 to 08-08-2013):

Heavy to very Heavy rainfall over North and Northeast Punjab is shown in the figure 28.

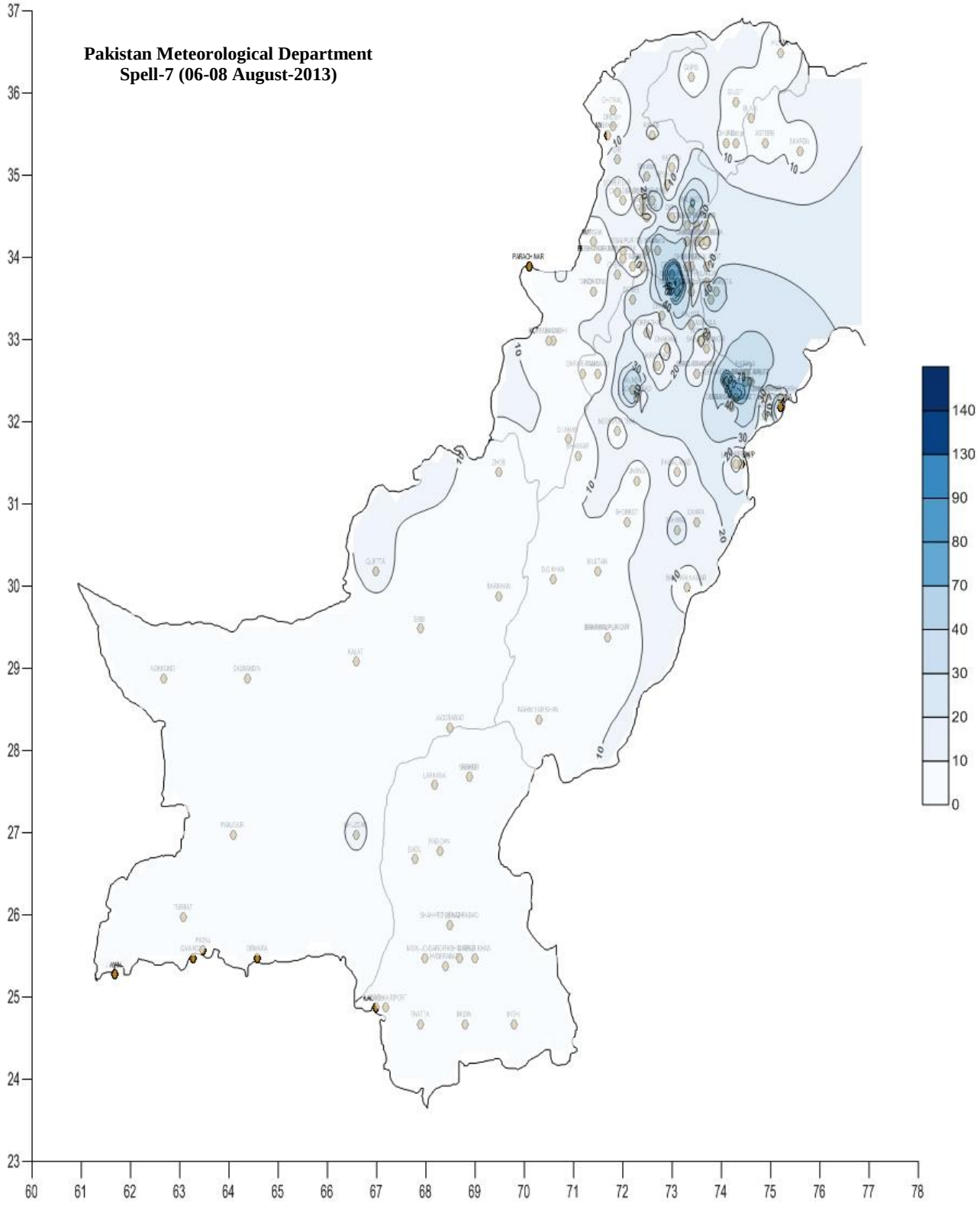
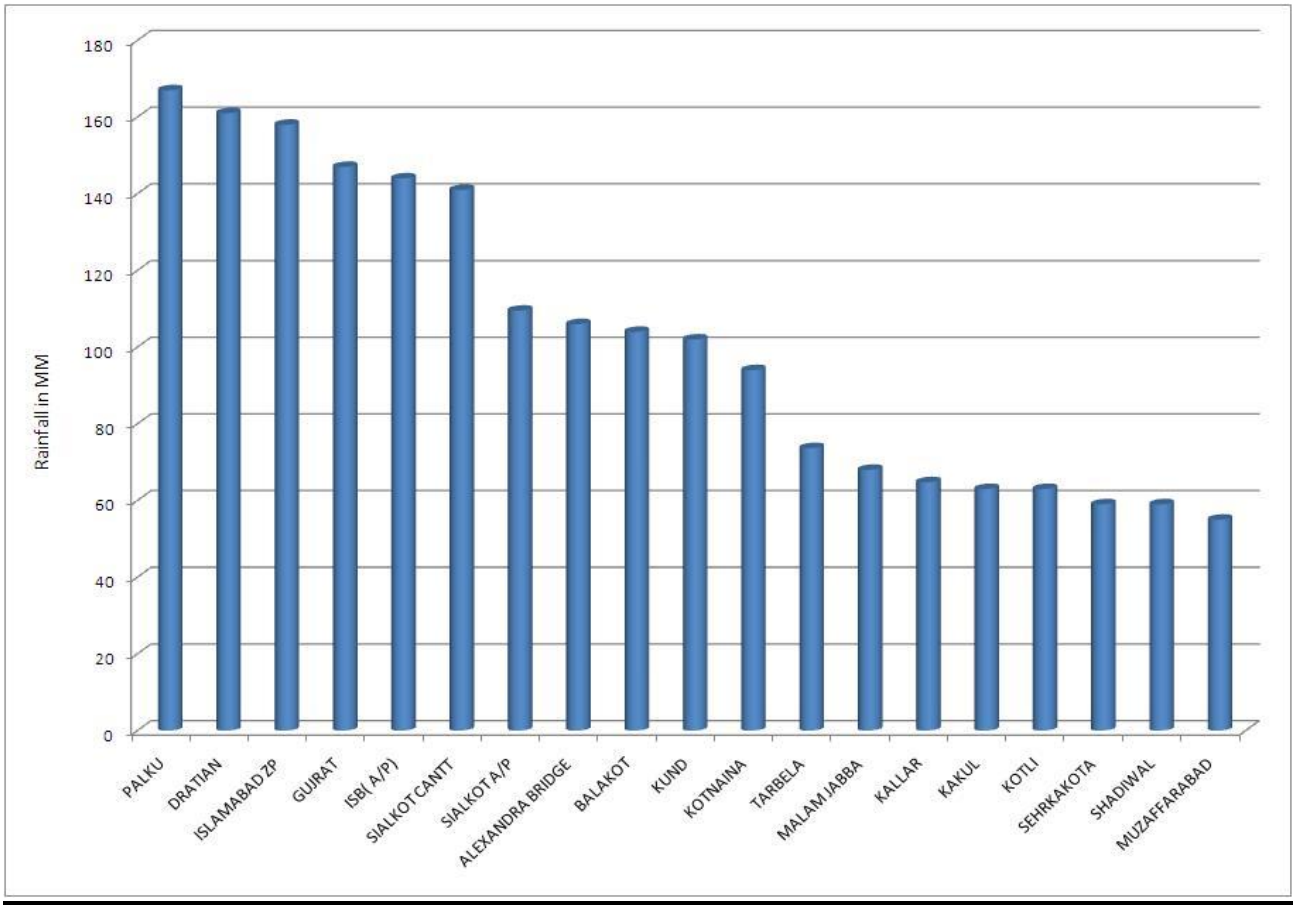


Figure 28: Wet spell of August-2013(06-08 August)

Significant rainfall more than 50 mm is shown below.



5.1.4 Rivers Position during the Spell:

During this spell, Medium flood situation upstream as well as downstream reported in river Indus at Taunsa, river Chenab at Marala and Low flood situation in river Jhelum at Mangla was (Upstream) reported.

5.1.5 Third Wet Spell of August (10-08-2013 to 15-08-2013):

The most significant spell of flood season, 2013 caused due to monsoon low over Rajasthan and adjoining Bahawalpur Division and the passage of westerly wave alongwith accentuation of seasonal low. During this spell heavy to very heavy rainfall was recorded over Upper catchments of river Chenab ,North Punjab, Khyber Pakhtunkhwa and Kashmir as shown in the figure 29 ;

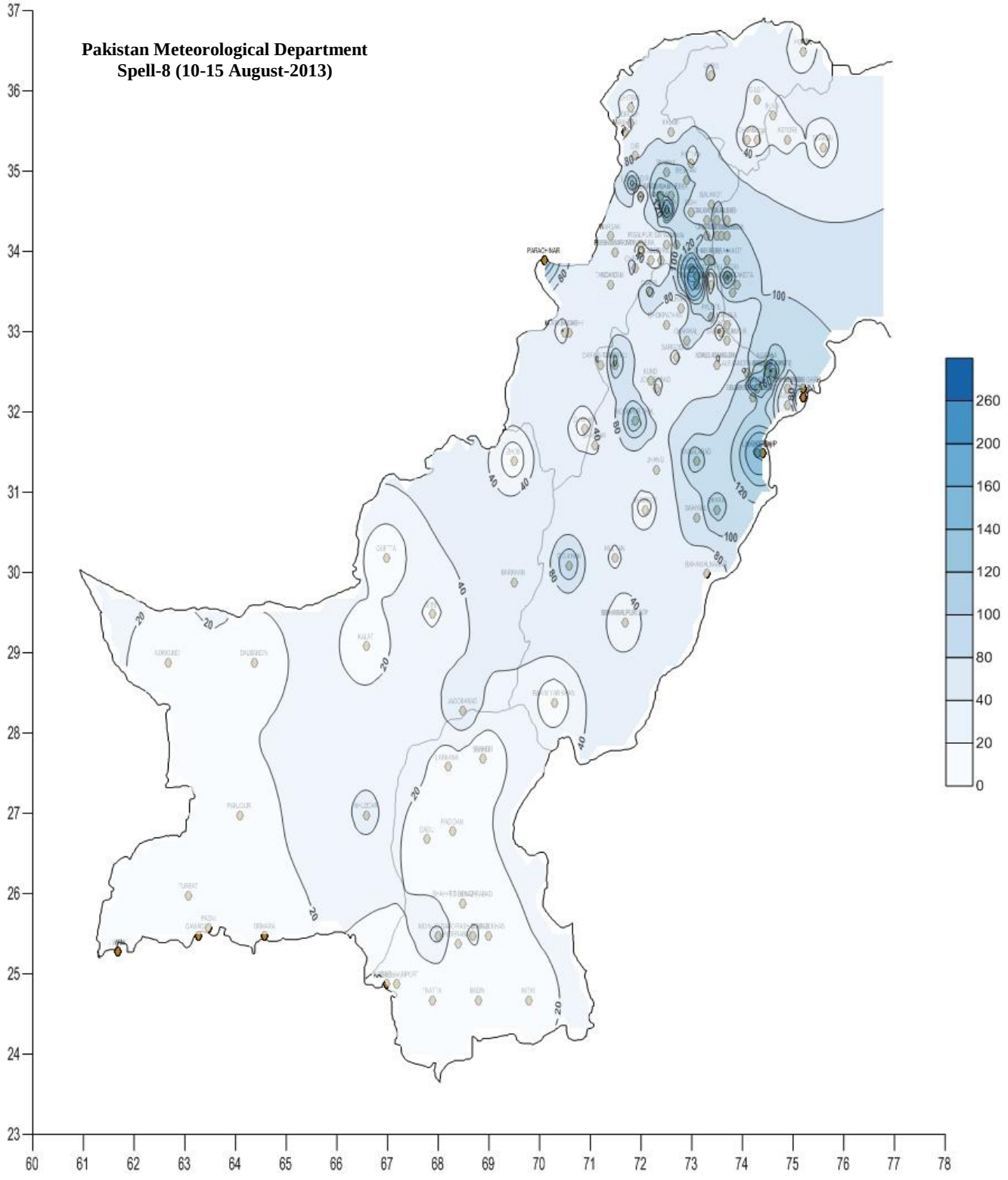
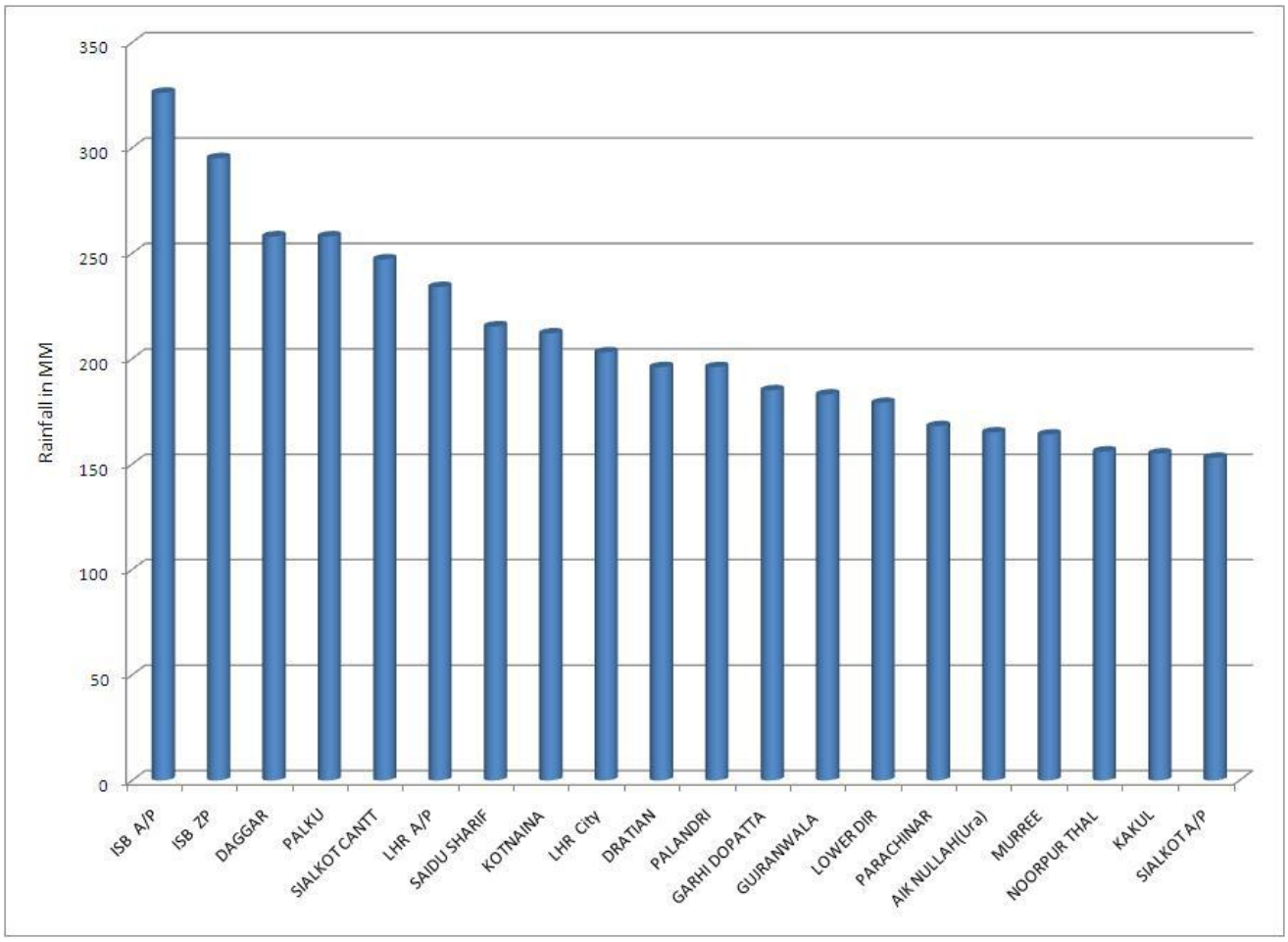


Figure 29: Wet spell of August-2013(10-15 August)

Significant rainfall more than 150 mm is shown below.



5.1.6 Rivers Position during the Spell:

Very High flood situation recorded in river Chenab at Khanki and Qadirabad. High flood situation observed at Marala in river Chenab, at Chashma in river Indus, at Nowshehra in river Kabul and at Mangla (Upstream) in River Jhelum.

5.1.7 Fourth Wet Spell of August (18-08-2013 to 19-08-2013):

This spell of August recorded from 18th to 19th August, 2013 was due to the interaction of a trough of westerly wave and a low over Indian Punjab. During this spell moderate rainfall was recorded over Kashmir and North Punjab as shown below:

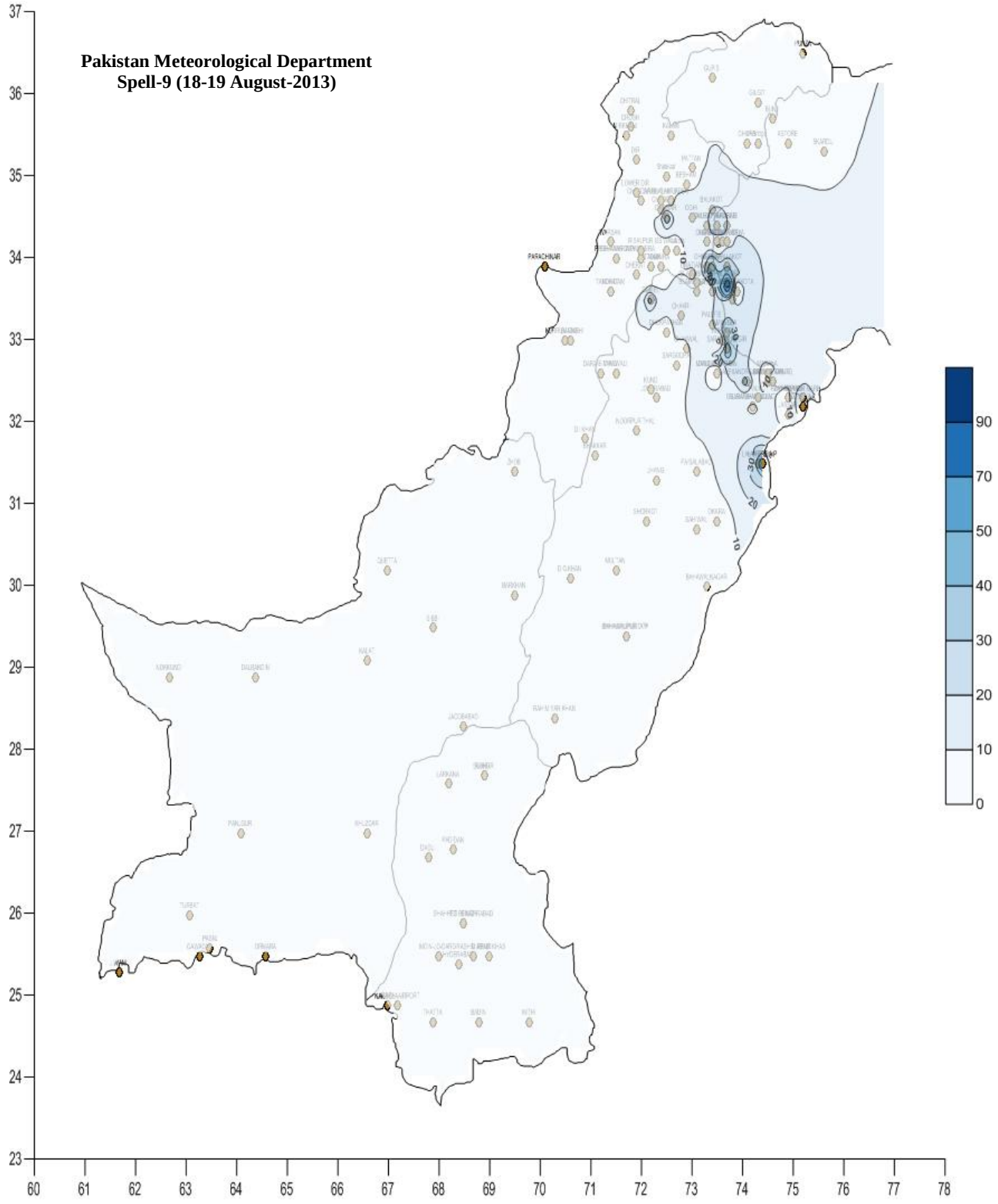
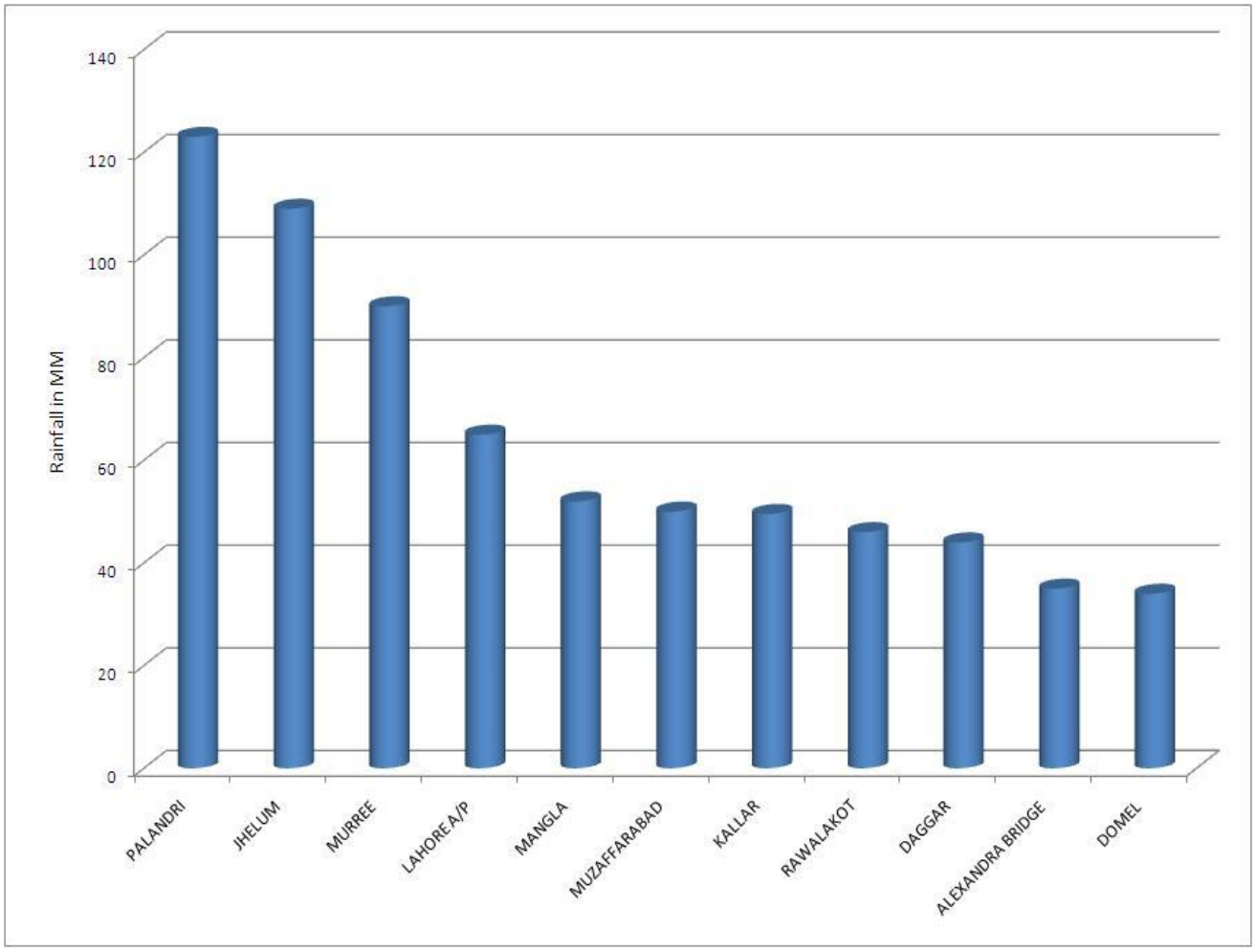


Figure 30: Wet spell of August-2013(18-19 August)

Significant rainfall more than 30 mm is shown below.



5.1.8 Rivers Position during the Spell:

High flood situation recorded in river Jhelum at Mangla (Upstream) during the spell.

5.1.9 Fifth Wet Spell of August (28-08-2013 to 30-08-2013):

Fifth and final spell occurred from 28th to 30th August, 2013 was due to westerly wave and accentuation of seasonal low. Rain fall distribution during the spell is shown below.

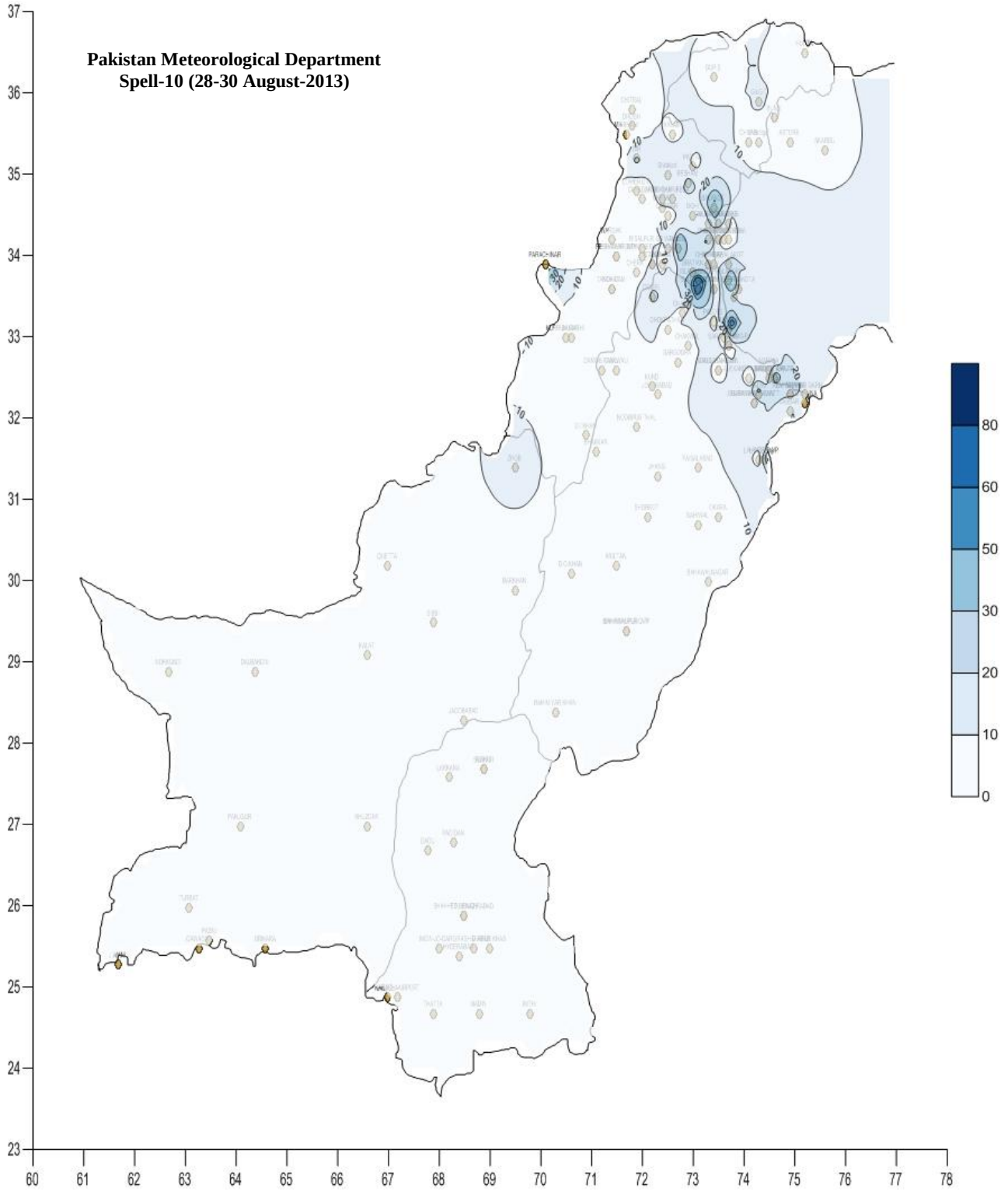
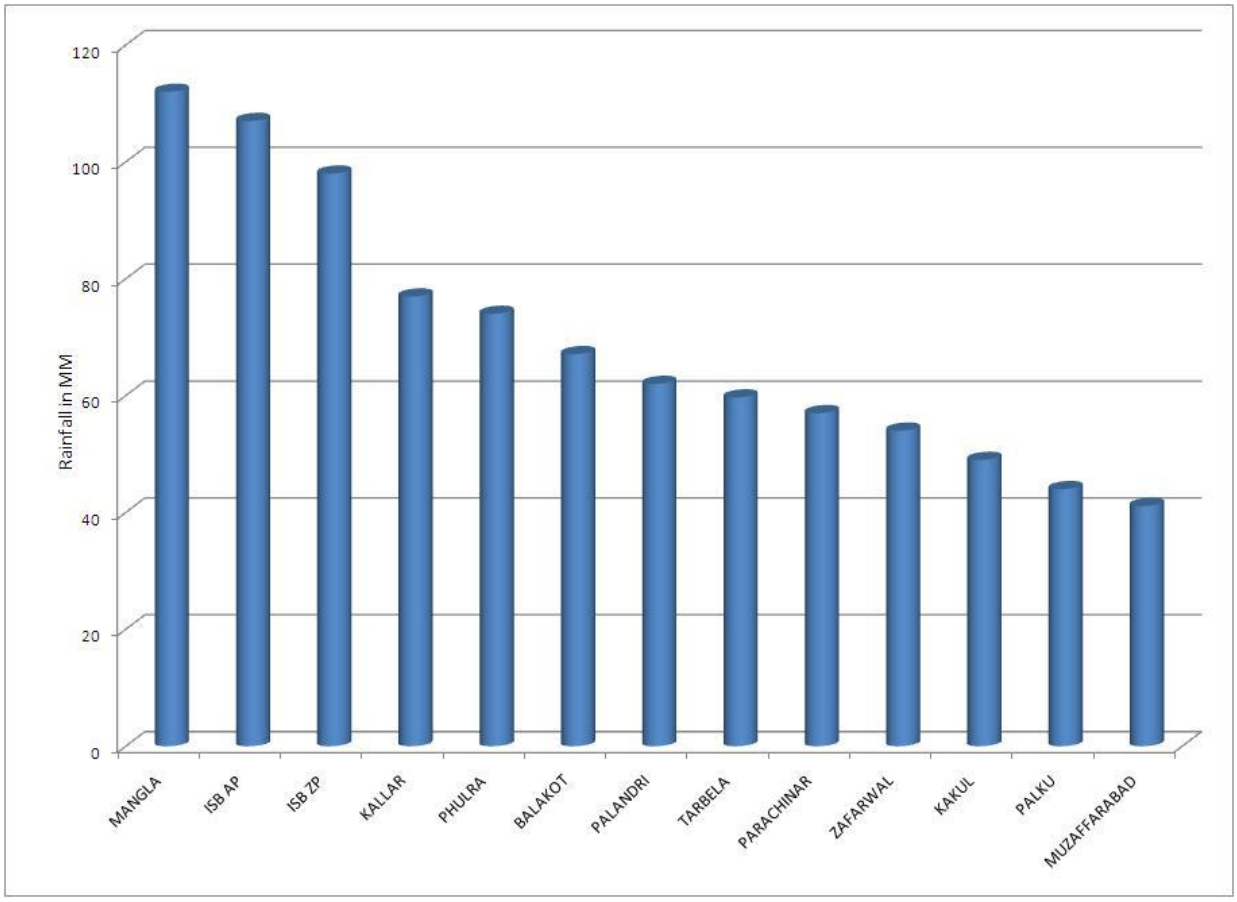


Figure 31: Wet spell of August-2013(28 -30 August)

Significant rainfall more than 40 mm is shown below.



5.1.10 Rivers Position during the Spell:

No significant flood peak recorded during the spell.

5.1.11 Rainfall Pattern for the month of August, 2013:

The monthly Isohyetal pattern during the month of August indicates normal monsoon activity over most parts of the country. Rainfall maxima exceeding 650 mm in the month of August, 2013 was encompassed one around Islamabad and one around Sialkot.

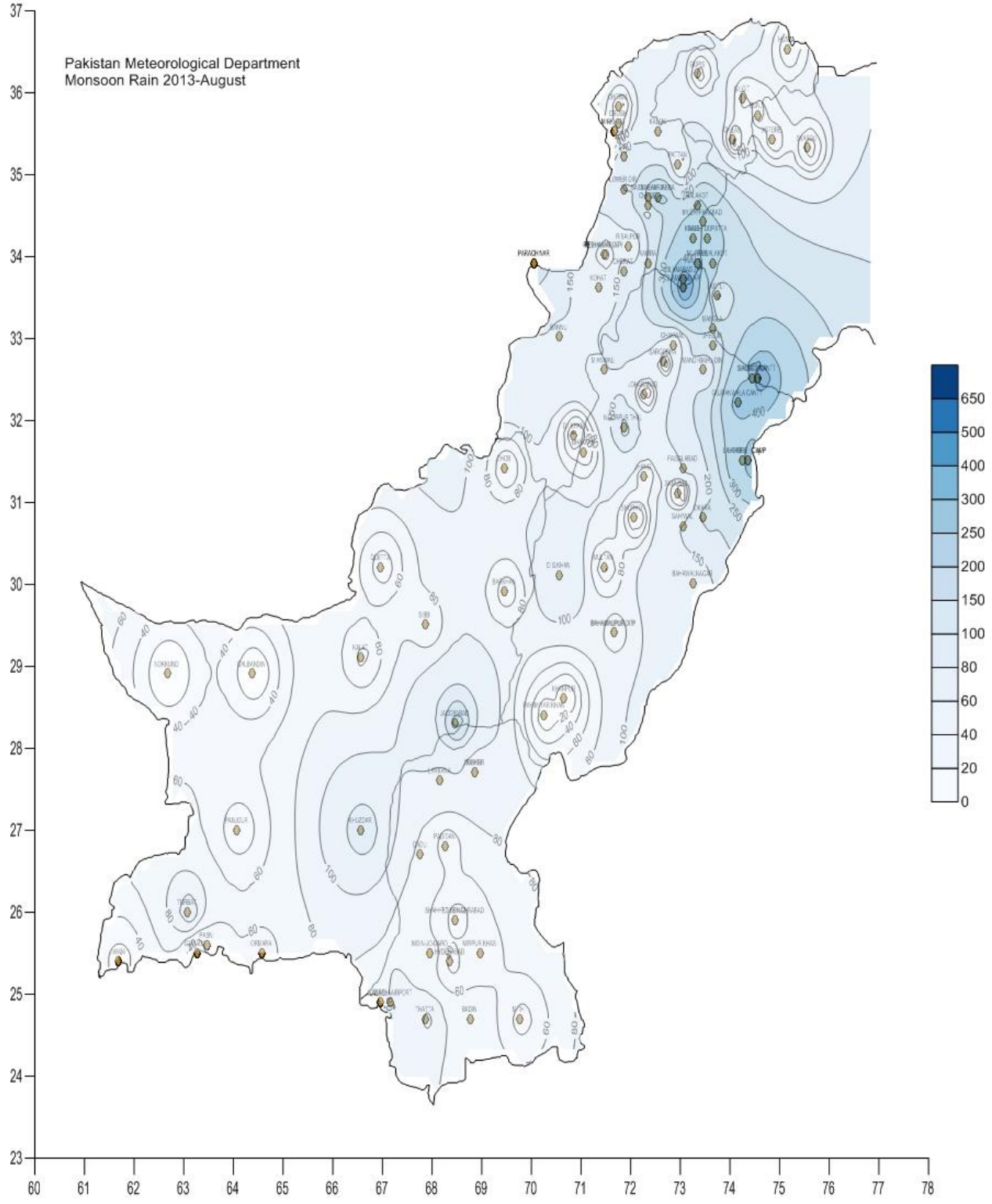


Figure 32: Isohyetal Map of August, 2013

5.1.12 Rivers Position during the Month:

Date	Stations	Up-stream (Cusecs)	Level
22/8/2013	Sulemanki	82370	Medium
25/8/2013	Islam	70932	Low
16/8/2013	Jassar	67700	Low
4/8/2013	Shahdara	49840	Low
17/8/2013	Shahdara	74880	Medium
5/8/2013	Balloki	75975	Medium
17/8/2013	Balloki	117770	High
23/8/2013	Sidhnai	87904	Medium
2/8/2013	Mangla	135000	Medium
6/8/2013	Mangla	95000	Low
7/8/2013	Mangla	94500	Low
13/8/2013	Mangla	179900	High
14/8/2013	Mangla	180000	High
19/8/2013	Mangla	170000	High
20/8/2013	Mangla	111000	Medium
1/8/2013	Marala	121437	Low
2/8/2013	Marala	121836	Low
6/8/2013	Marala	123910	Low
7/8/2013	Marala	130884	Low
10/8/2013	Marala	120624	Low
13/8/2013	Marala	152690	Medium
15/8/2013	Marala	377290	High
15/8/2013	Marala	228810	High
15/8/2013	Khanki	410331	Very High
15/8/2013	Qadirabad	408878	Very High
20/8/2013	Trimmu	272609	Medium

25/8/2013	Punjnad	317261	High
4/8/2013	Tarbela	349000	Low
4/8/2013	Tarbela	349000	Low
14/8/2013	Tarbela	392000	Medium
4/8/2013	Kabul	116400	Medium
14/8/2013	Kabul	144870	High
15/8/2013	Kabul	135000	Medium
5/8/2013	Kalabagh	402716	Medium
13/8/2013	Kalabagh	479603	Medium
14/8/2013	Kalabagh	456734	Medium
15/8/2013	Kalabagh	460131	Medium
3/8/2013	Chashma	476176	Medium
4/8/2013	Chashma	508345	High
13/8/2013	Chashma	503459	High
14/8/2013	Chashma	649689	Very High
16/8/2013	Chashma	549926	High
6/8/2013	Taunsa	397521	Medium
7/8/2013	Taunsa	415736	Medium
16/8/2013	Taunsa	516017	High
17/8/2013	Taunsa	516017	High
20/8/2013	Guddu	567418	High
24/8/2013	Sukkur	510875	High
30/8/2013	Kotri	381696	Medium
9/8/2013	Bain Nullah at Shakragarh	9925	Medium
10/8/2013	Deg Nullah at QS Singh	3960	Low
15/8/2013	Aik Nullah at Ura	40711	Ex.High
15/8/2013	Basentar Nullah	10880	High
16/8/2013	Palku Nullah	9700	High

Hydrographs observed during the month of August, 2013are as under:

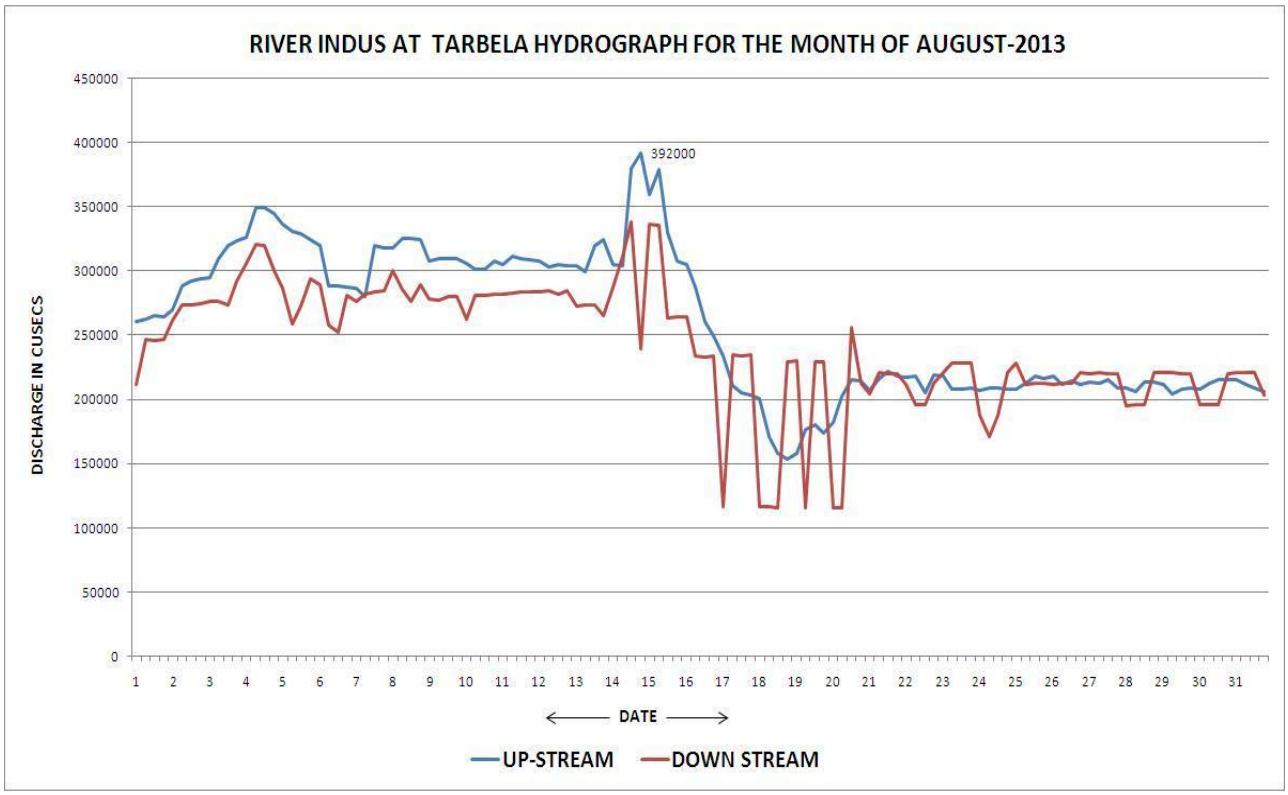


Figure 33: *Hydrograph (River Indus at Tarbela August, 2013)*

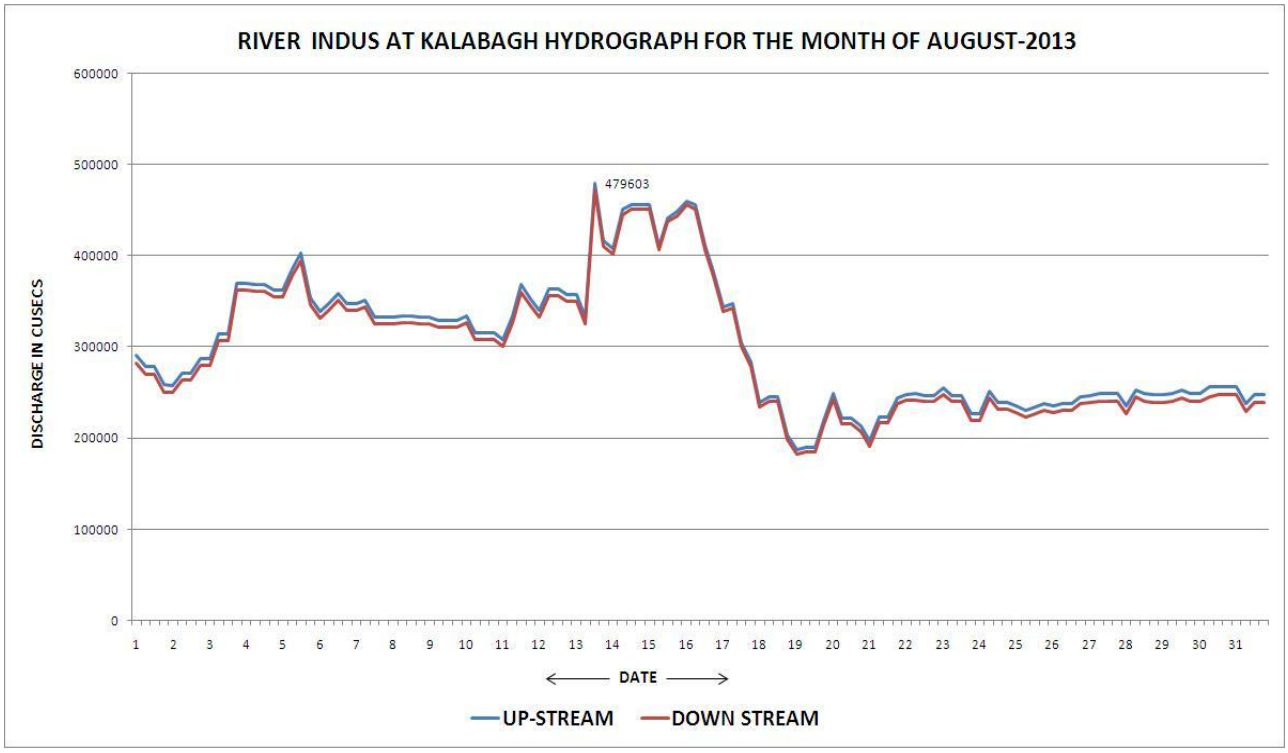


Figure 34: *Hydrograph (River Indus at Kalabagh August, 2013)*

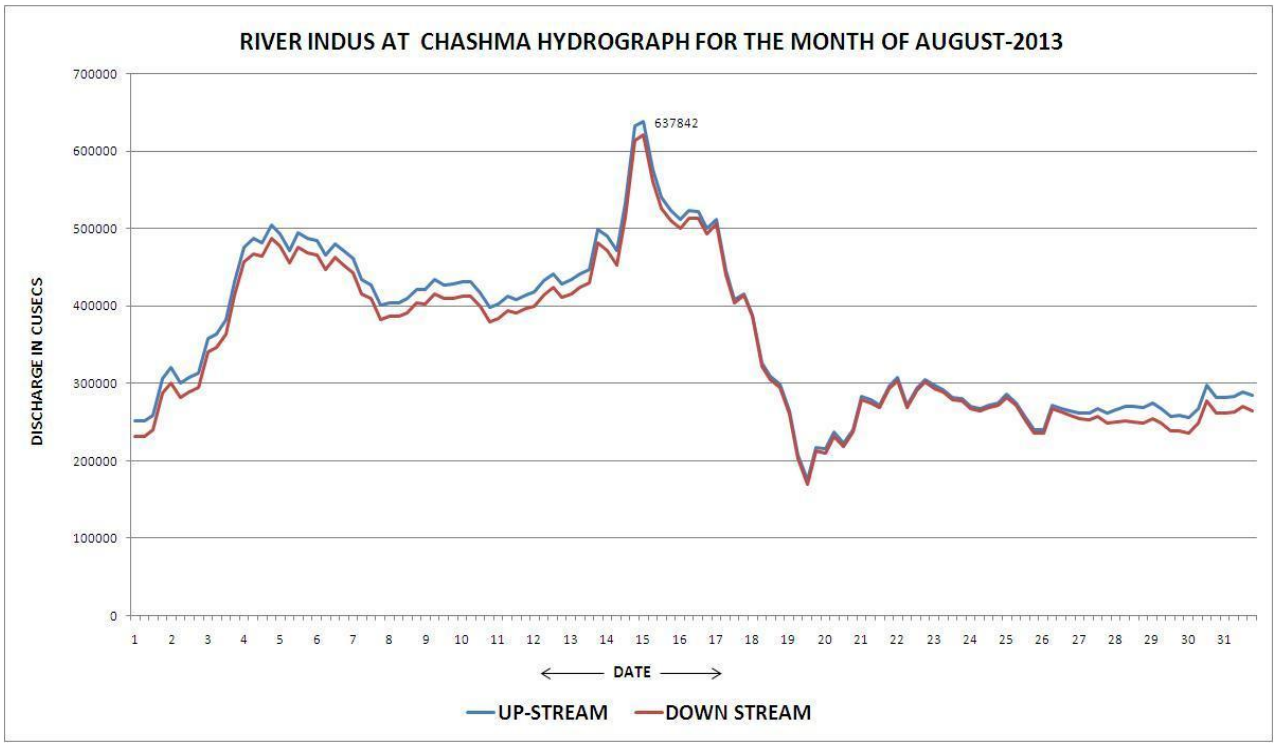


Figure35: *Hydrograph (River Indus at Chashma Augus,t 2013)*

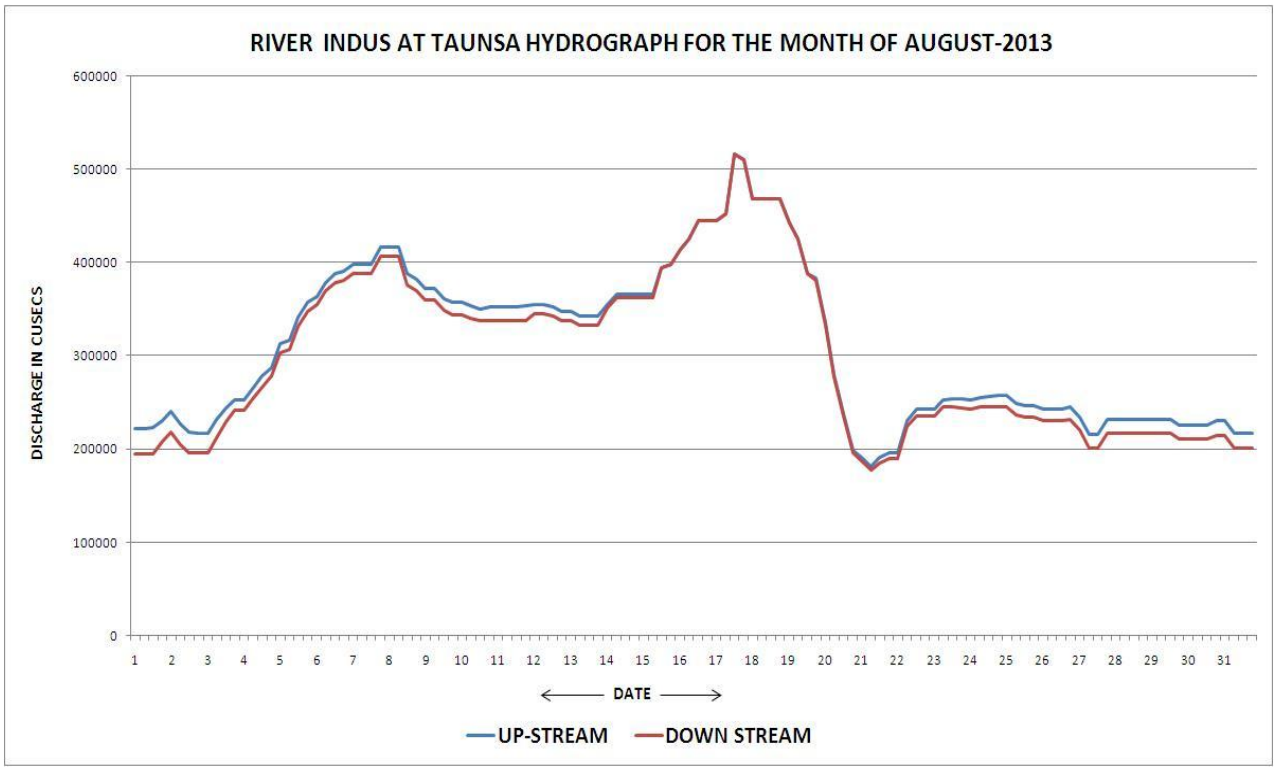


Figure 36: *Hydrograph (River Indus at Taunsa August, 2013)*

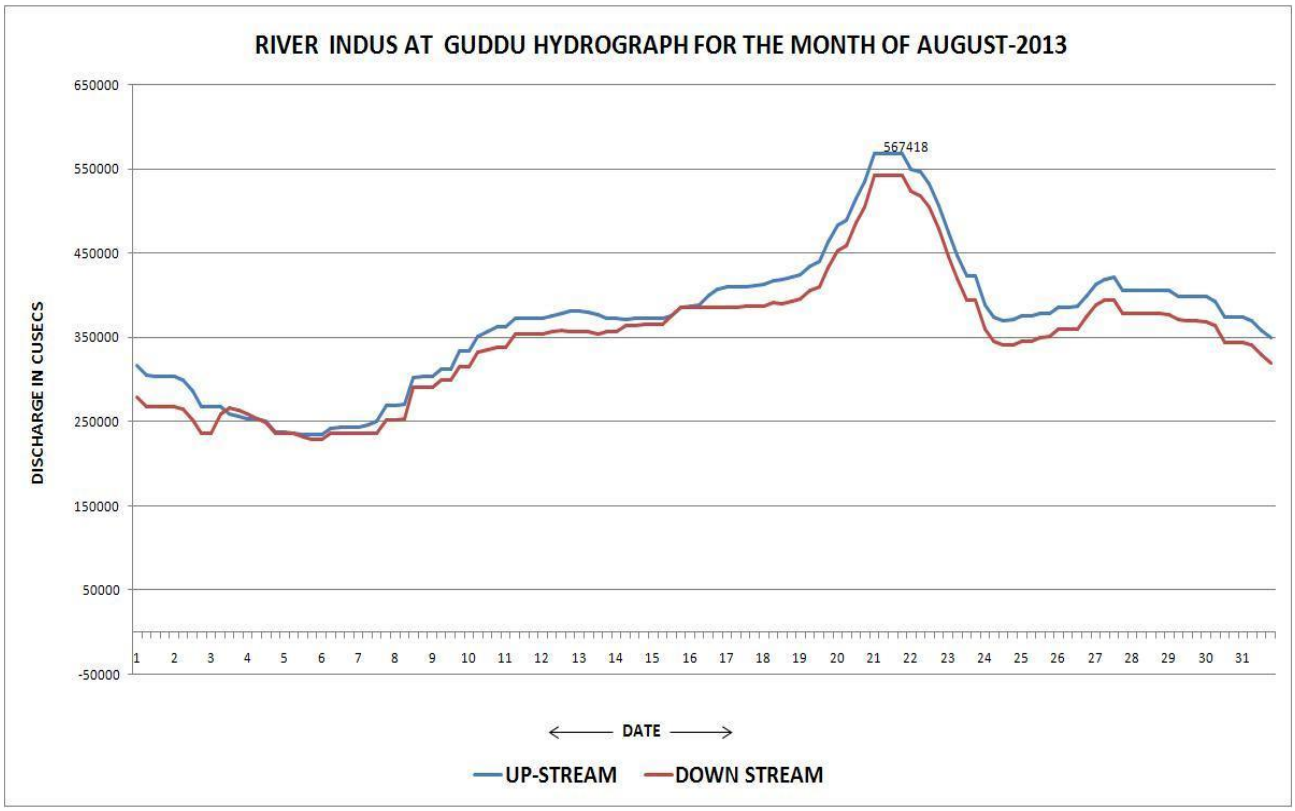


Figure37: *Hydrograph (River Indus at Guddu August 2013)*

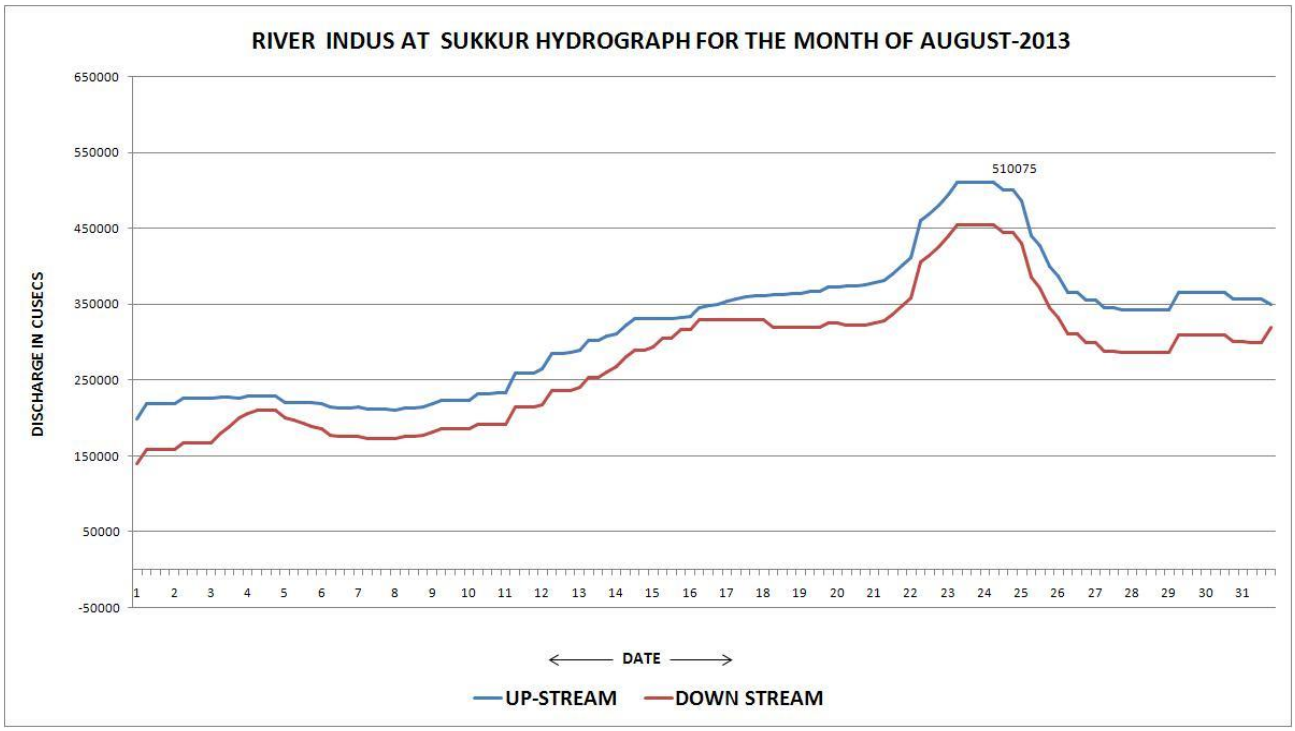


Figure 38: *Hydrograph (River Indus at Sukkur August, 2013)*

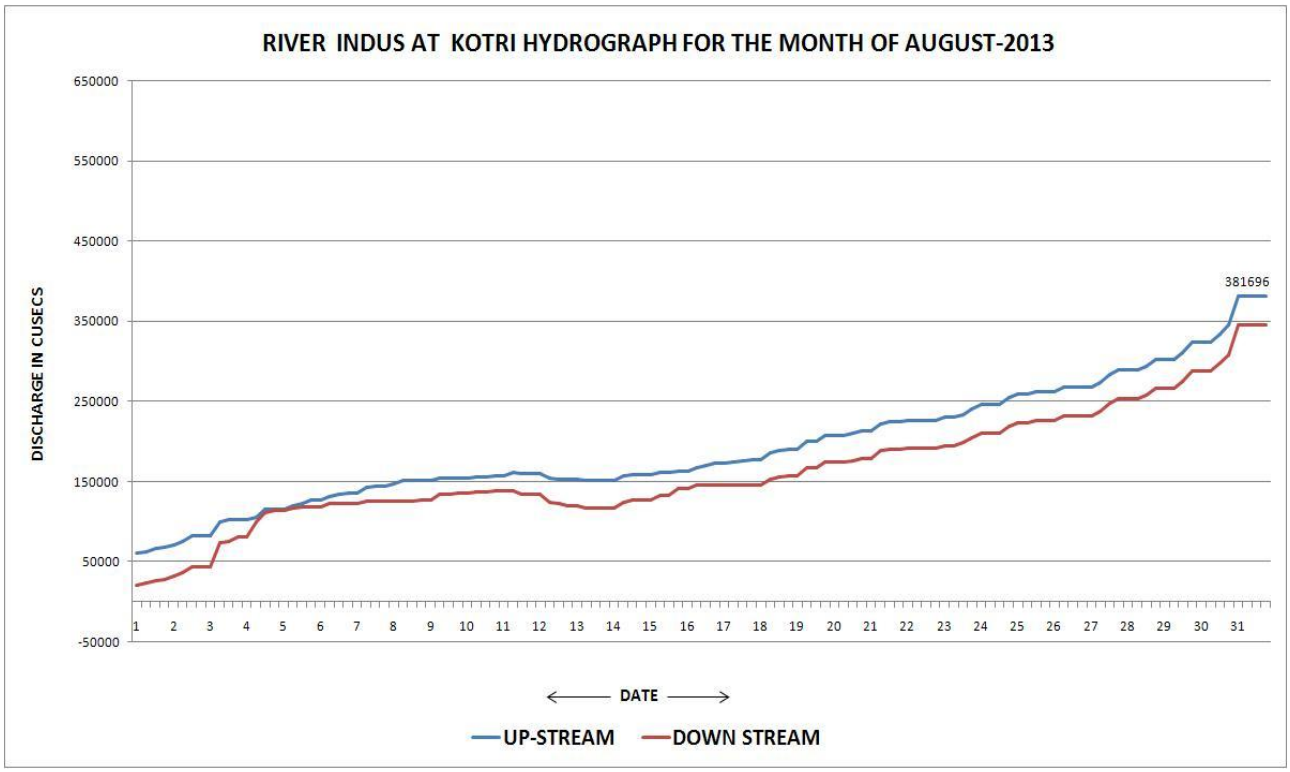


Figure 39: *Hydrograph (River Indus at Kotri Augus, 2013)*

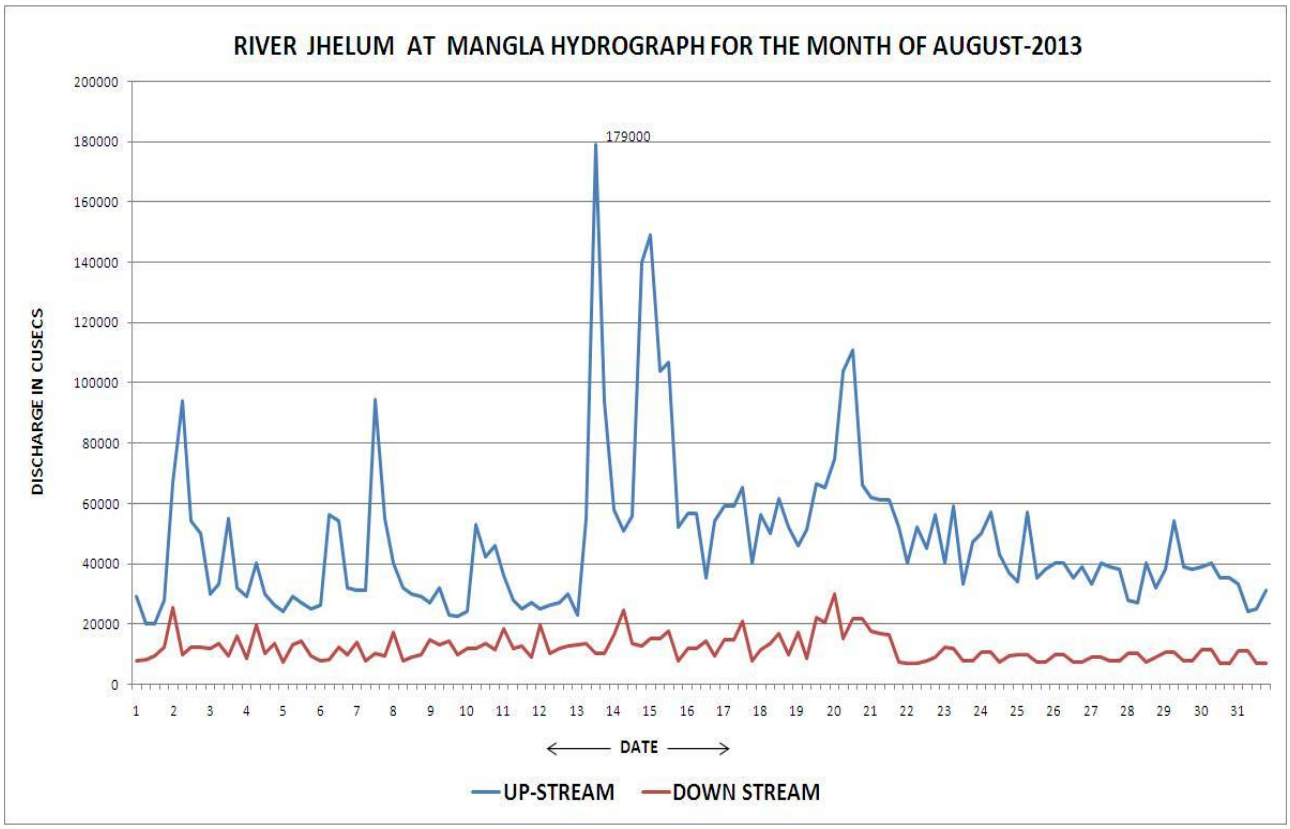


Figure 40: *Hydrograph (River Jhelum at Mangla August, 2013)*

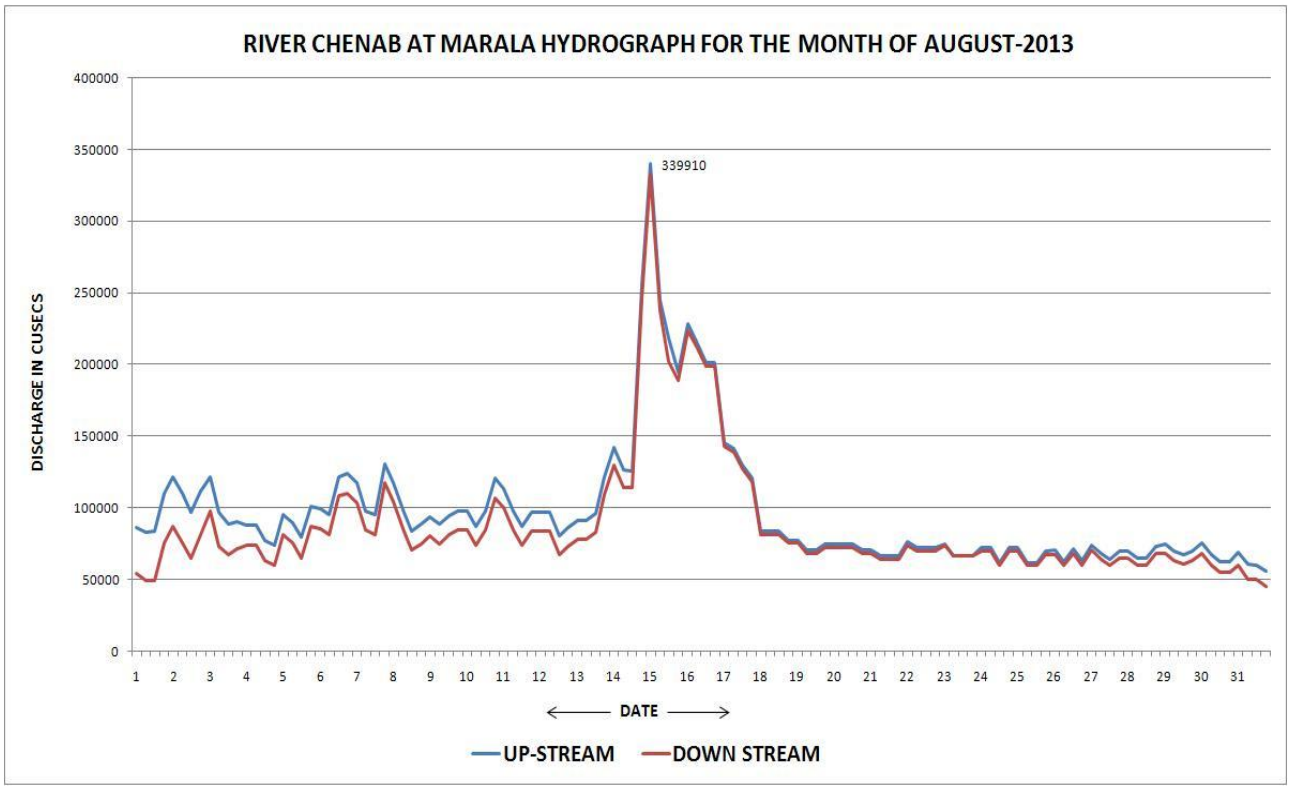


Figure 41: *Hydrograph (River Chenab at Marala Augus, 2013)*

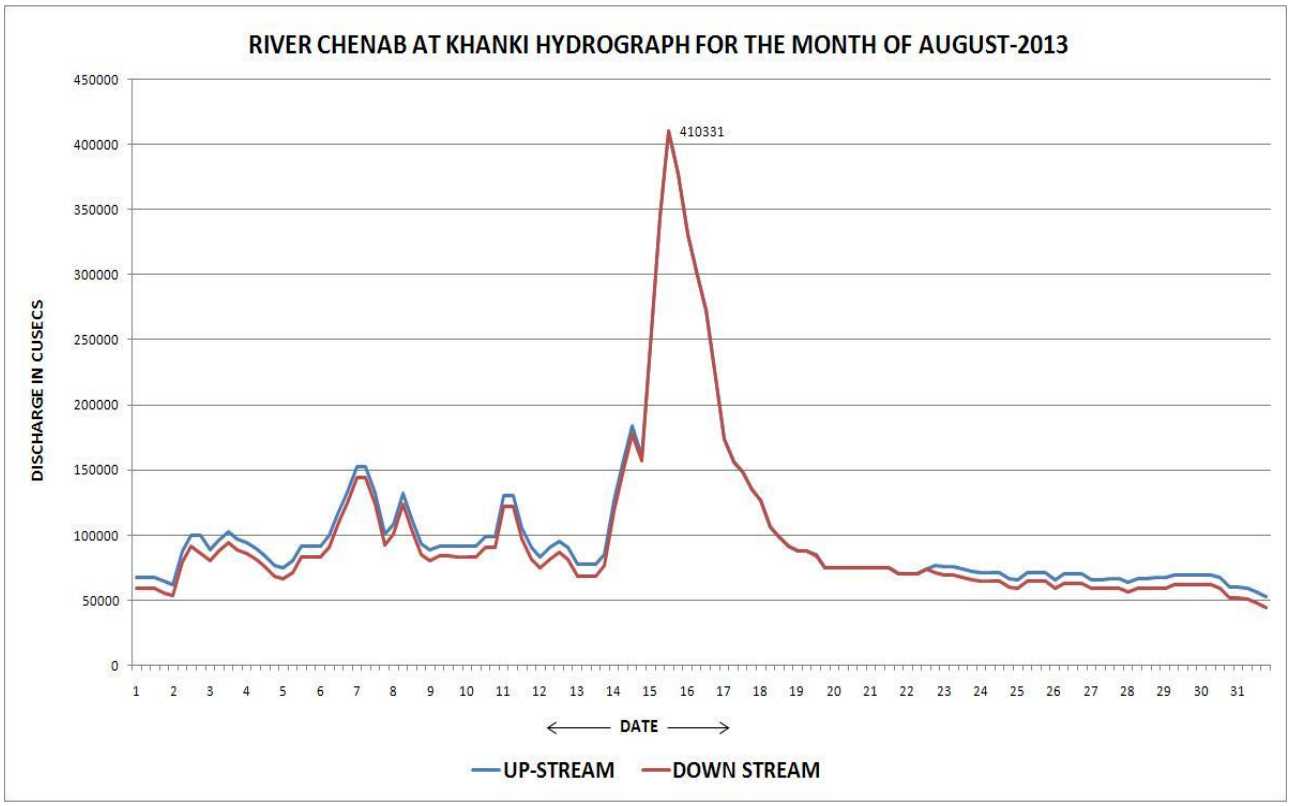


Figure 42: *Hydrograph (River Chenab at Khanki Augus, 2013)*

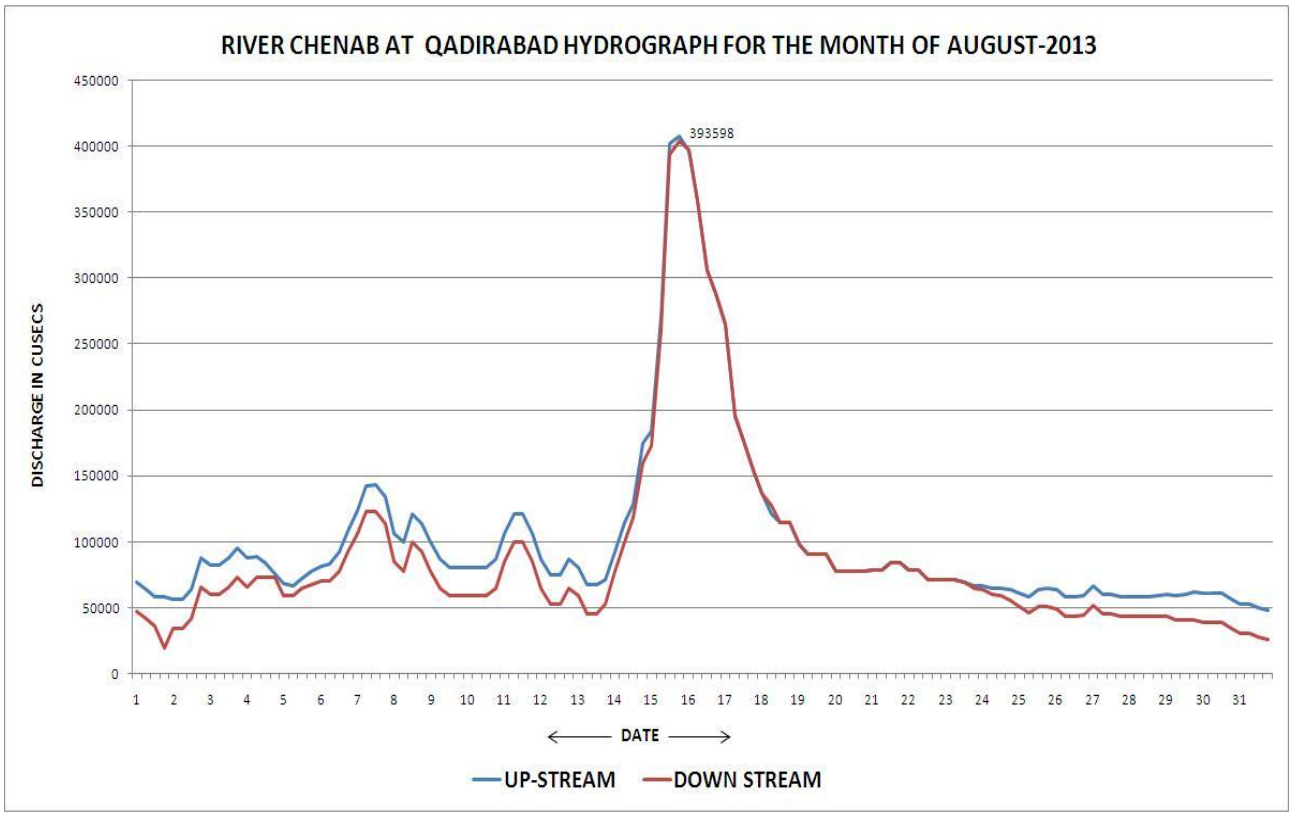


Figure 43: *Hydrograph (River Chenab at Qadirabad August,2013)*

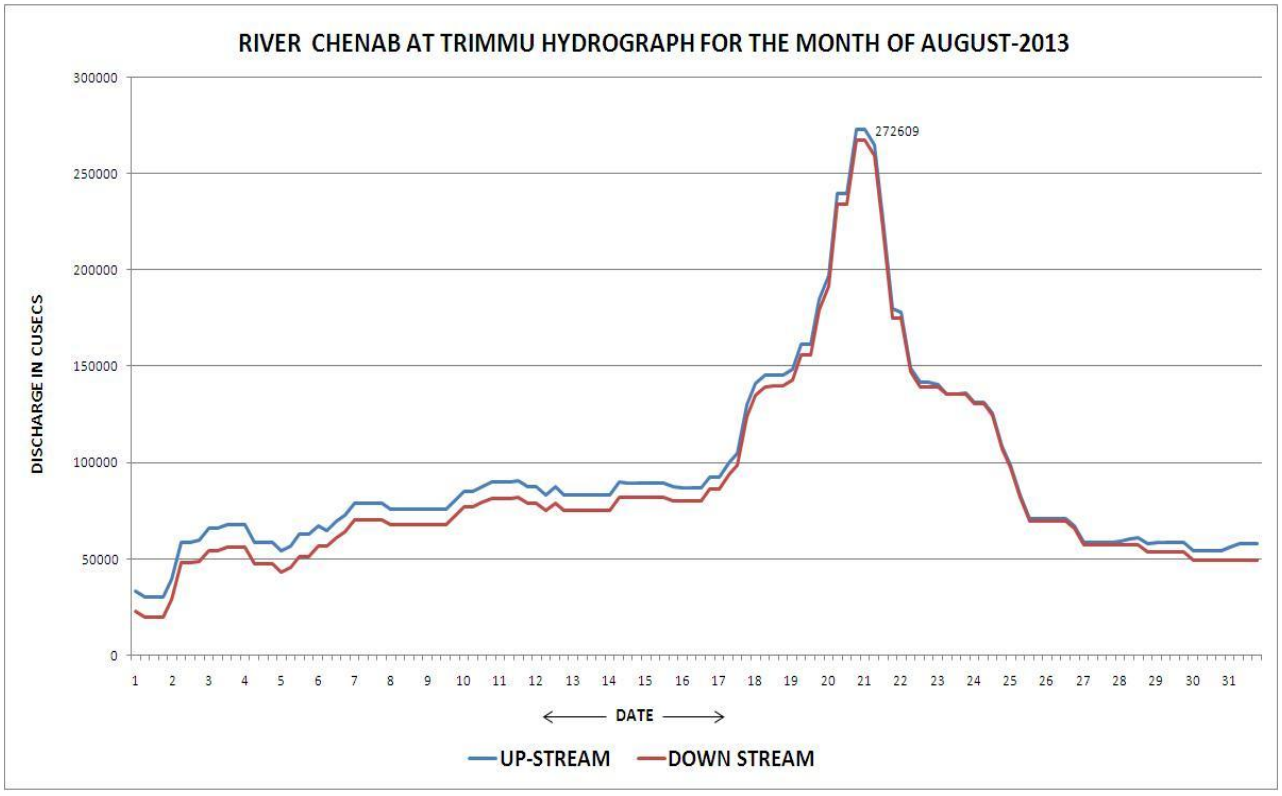


Figure 44: *Hydrograph (River Chenab at Trimmu August, 2013)*

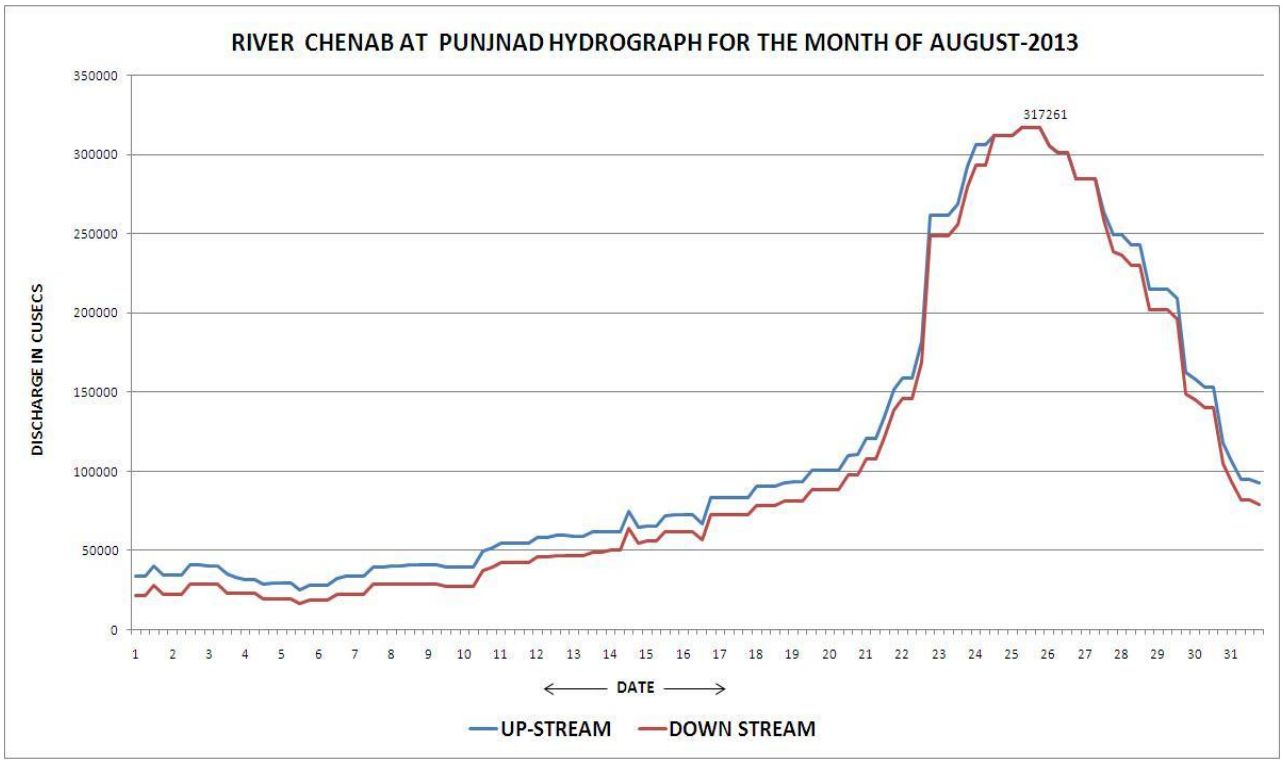


Figure 45: *Hydrograph (River Chenab at Punjnad August, 2013)*

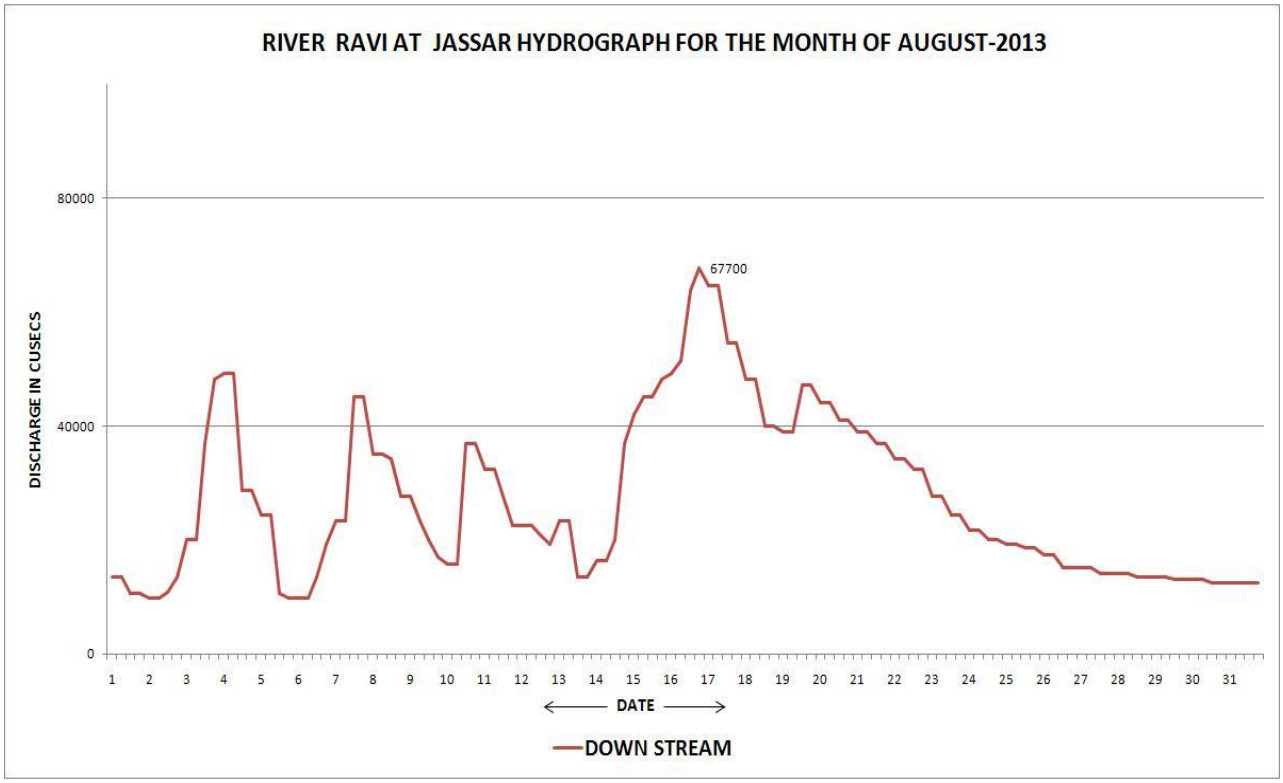


Figure 46: *Hydrograph (River Ravi at Jassar August, 2013)*

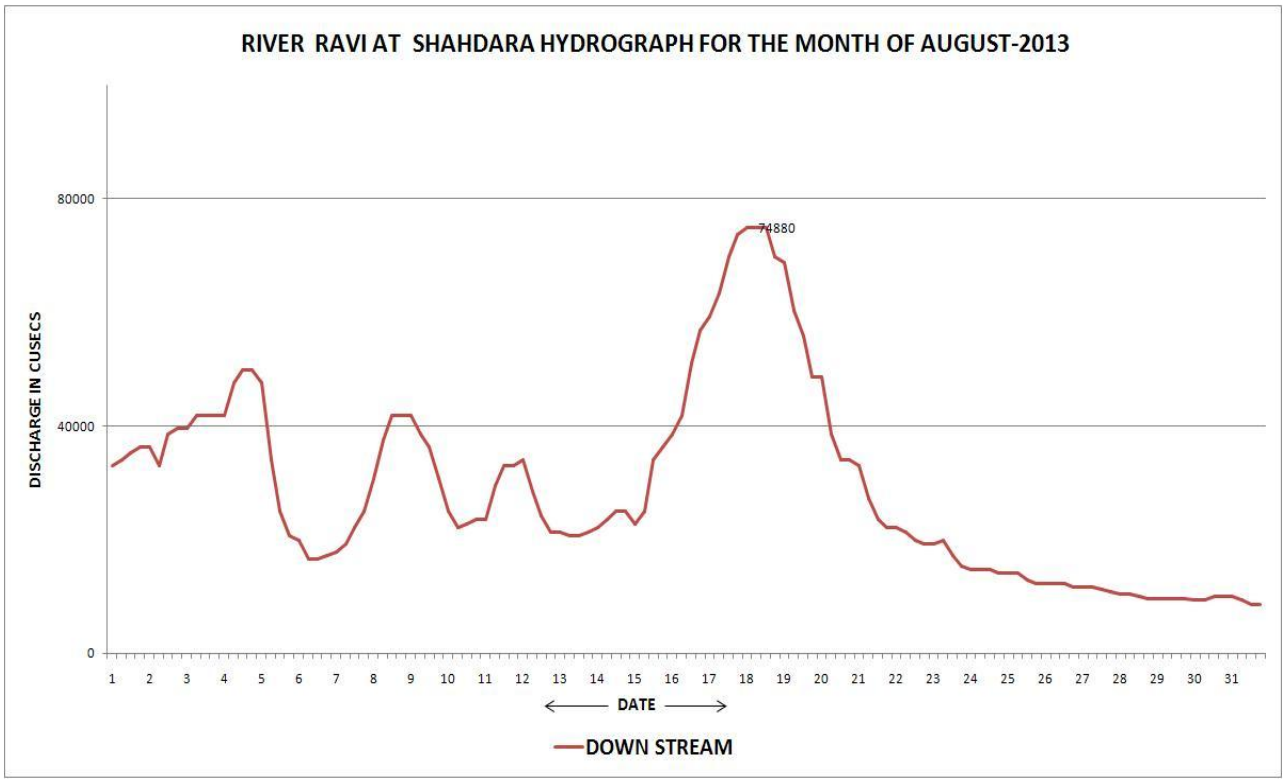


Figure 47: *Hydrograph (River Jassar at Shahdara August, 2013)*

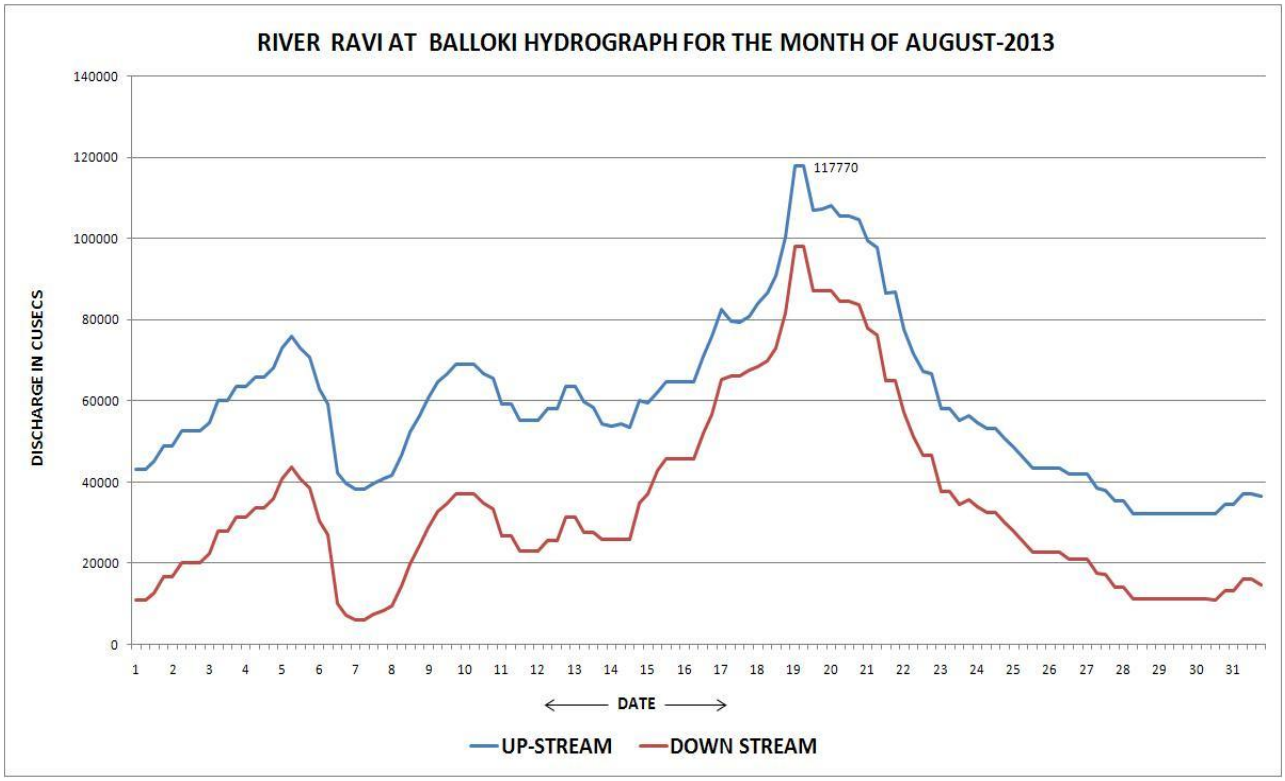


Figure 48: *Hydrograph (River Ravi at Balloki August ,2013)*

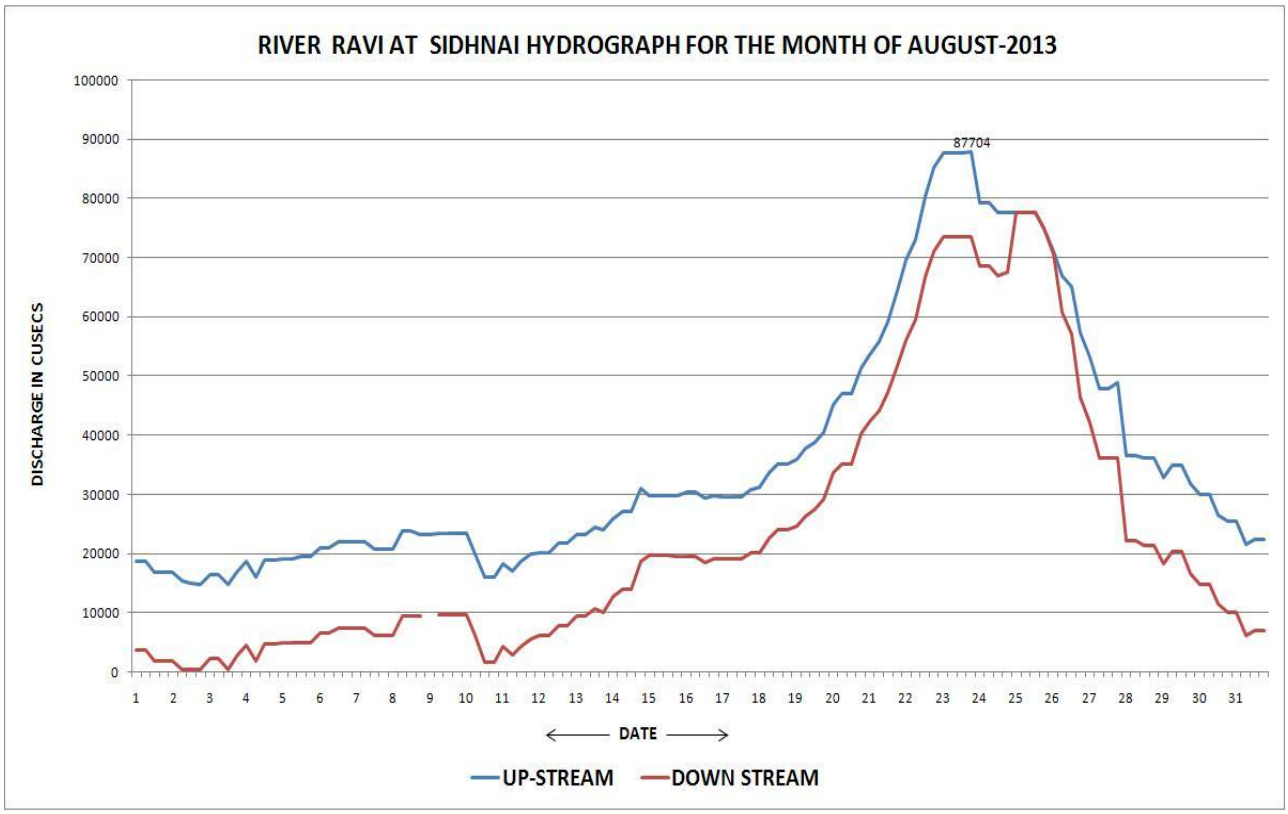


Figure 49: *Hydrograph (River Ravi at Sidhnai August, 2013)*

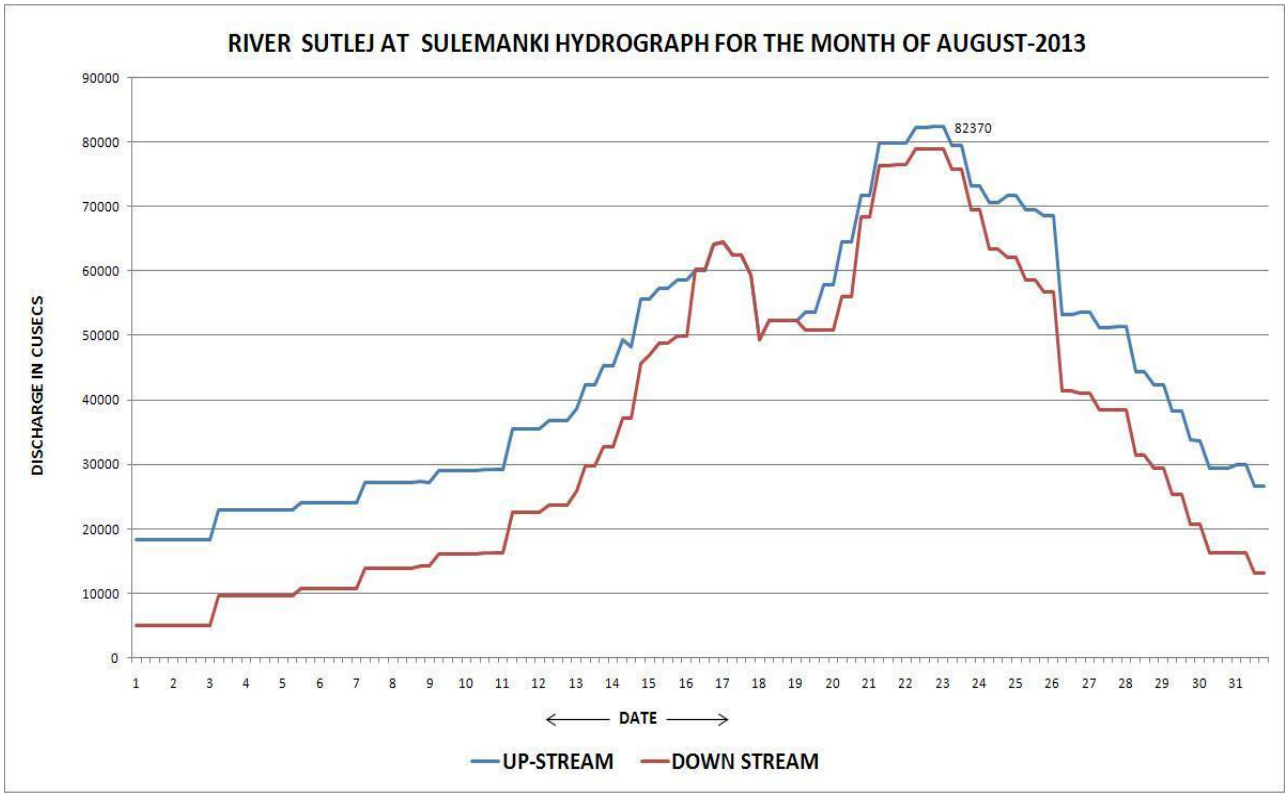


Figure 50: *Hydrograph (River Sutlej at Sulemanki August, 2013)*

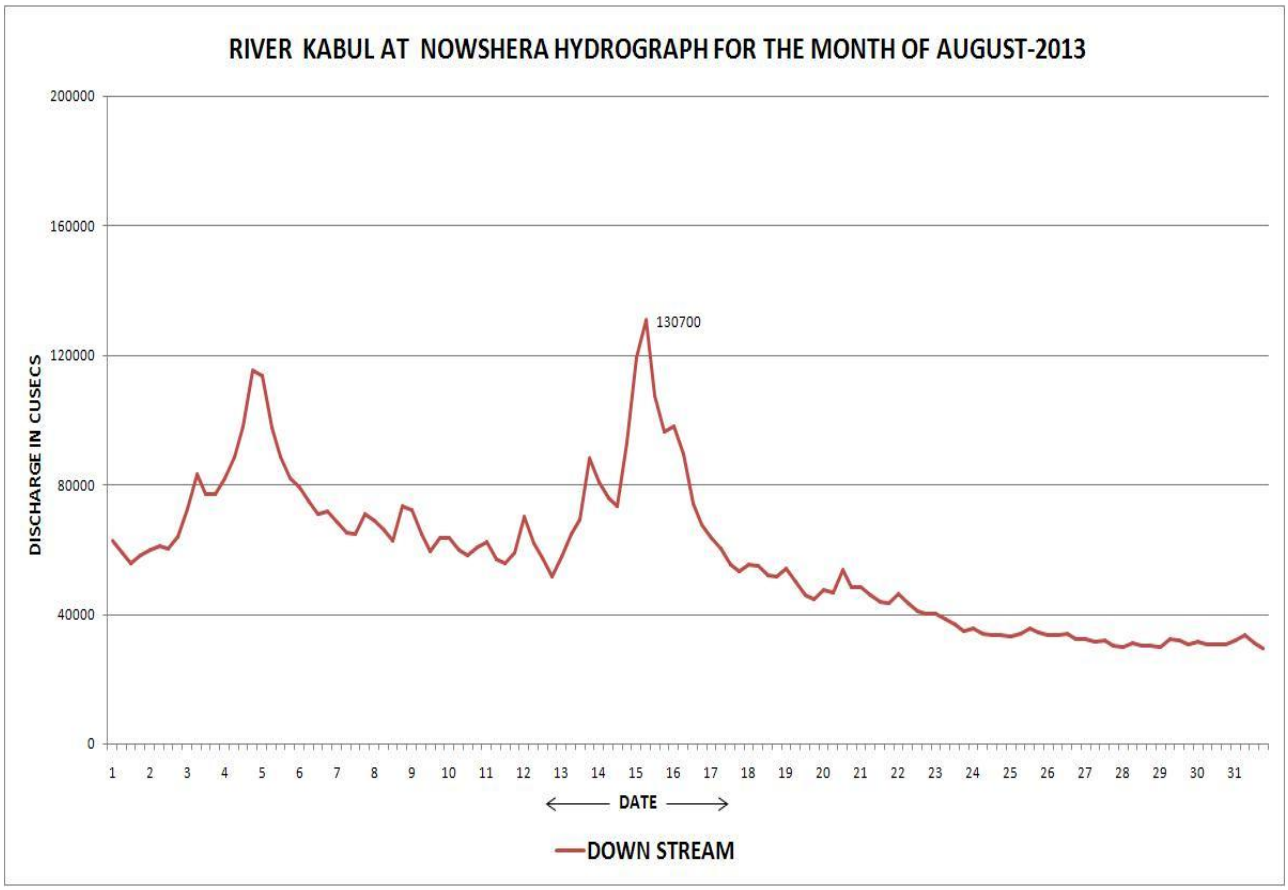


Figure 51: *Hydrograph (River Kabul at Nowshehra August, 2013)*

6 Significant Hydro-Meteorological Events during the Month of Sep, 2013:

Only one monsoon low developed during the month of September over Bay of Bengal on 19th of the month, after moving west northwest it reached over Gujarat on 25th and died out here with out entering Pakistan.

6.1 First Wet Spell (09-09-2013 to 11-09-2013):

First rainy spell of September occurred during 9th to 11th September, 2013 . During this spell light to moderate rain occurred over north Punjab and Kashmir as shown below.

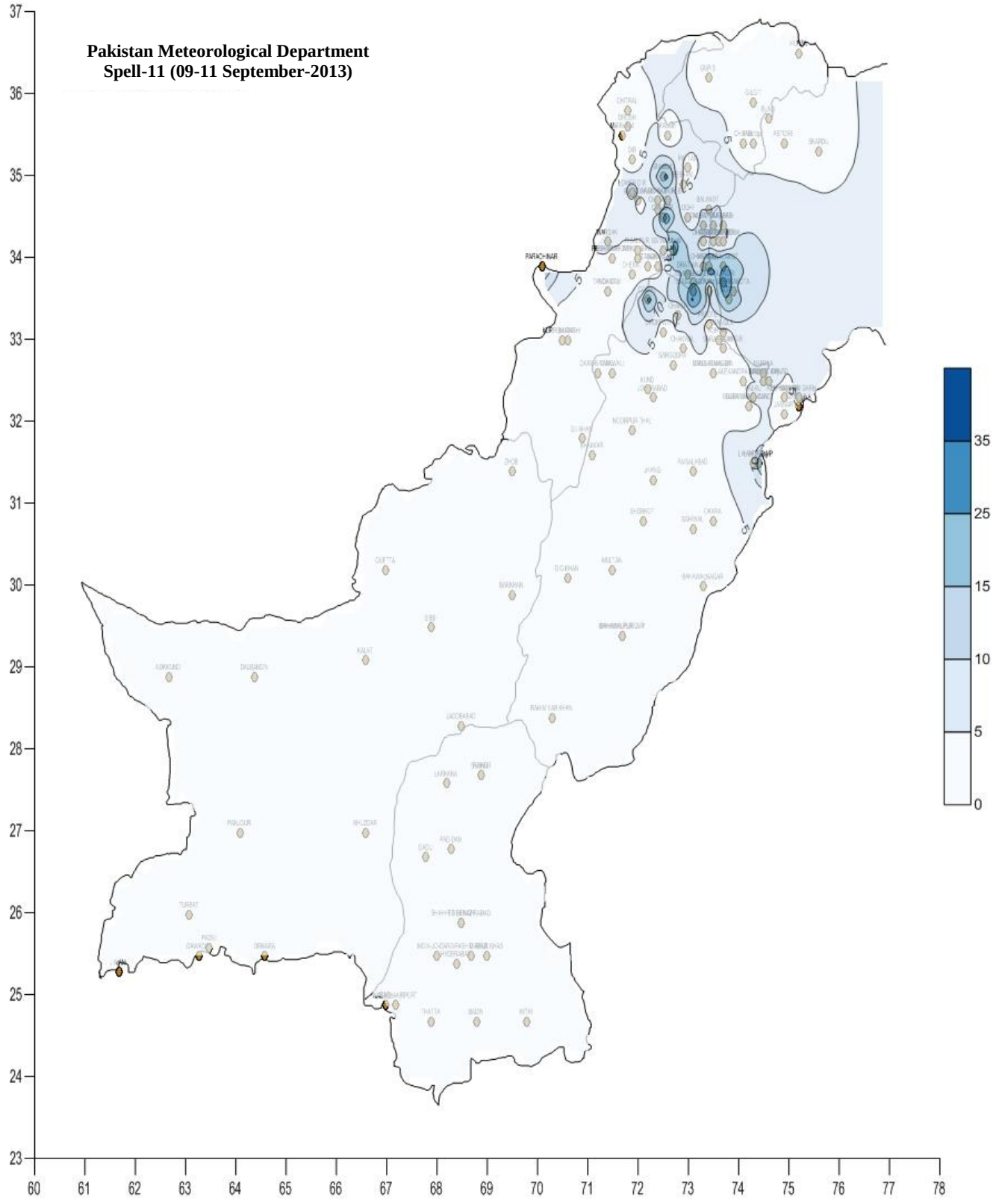
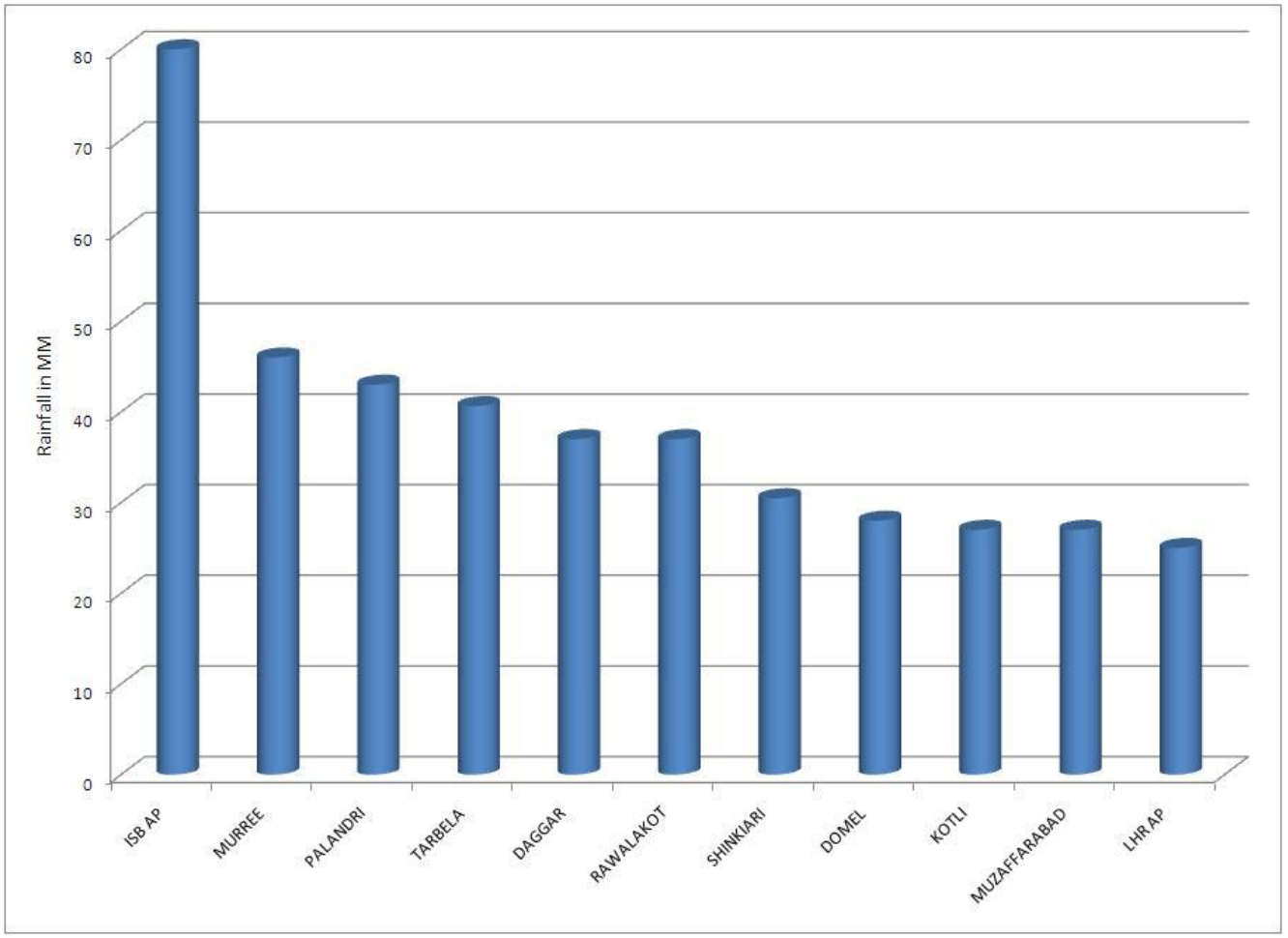


Figure 52: Wet spell of September.2013 (09-11 September)

Significant rainfall more than 25 mm is shown below.



6.2 Rivers Position during the Month:

No significant change in any river, nullahs and hill torrents was observed.

6.3 Rainfall Pattern for the Month of September, 2013:

A rainfall maximum of more than 300 mm was located around North Punjab as Shown below.

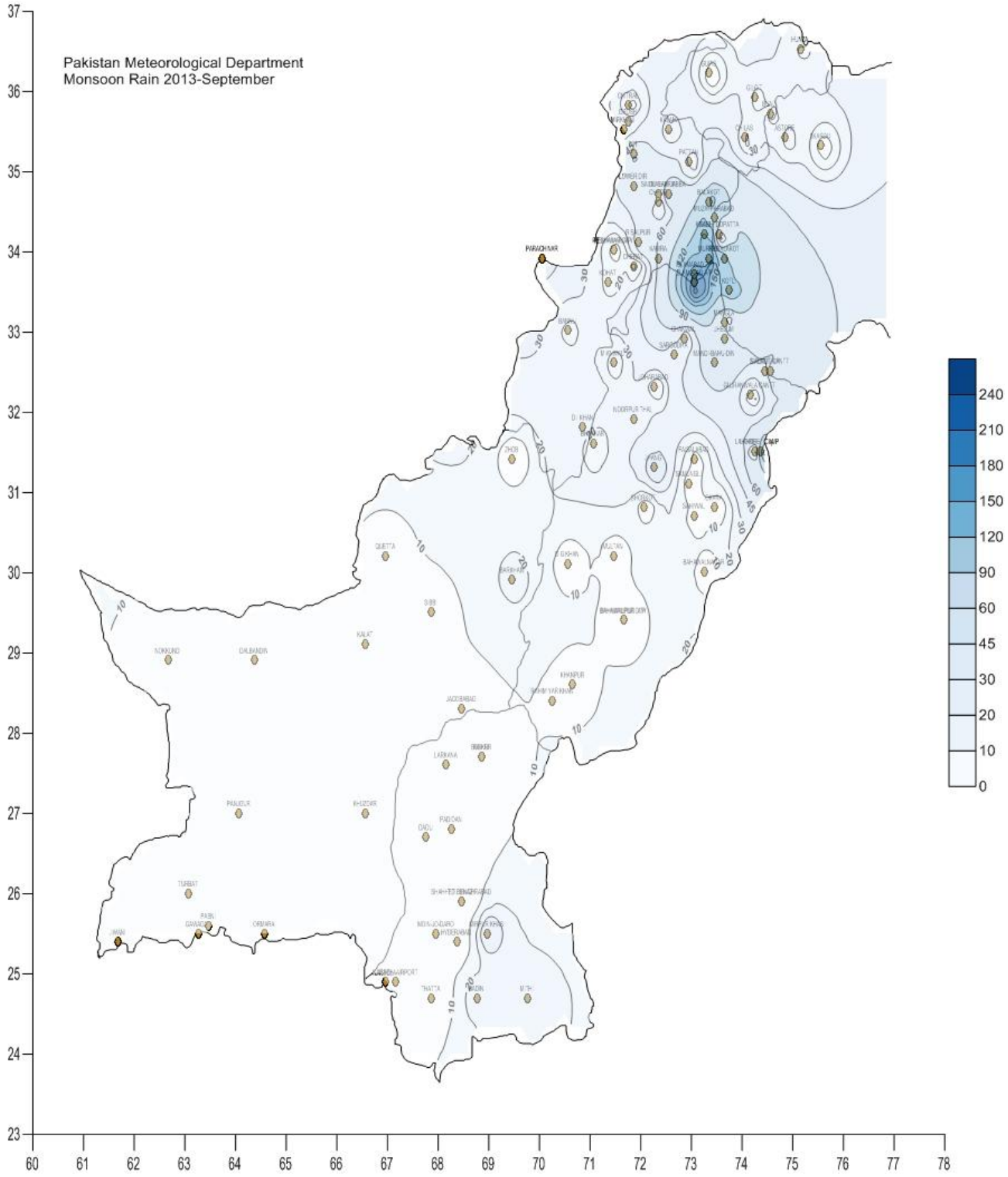


Figure 53: Isohyetal Map of September, 2013

6.4 Rivers Position during the Month:

No significant flood peak recoded during the month.

6.5 Significant Flood in River Chenab:

Most significant peak of Flood Season-2013 in River Chenab at Marala was due to the monsoon low around Bahawalpur division along with strong westerly wave over Northern parts of Pakistan & Kashmir. Under the presence of strong westerly wave the Seasonal low accentuated, resulting influx of moist current from Bay of Bengal & Arabian Sea, causing heavy rainfall over the upper catchments of River Chenab. Hydrographs during the peak in River Chenab at Marala, Khanki, and Qadirabad are shown as below:

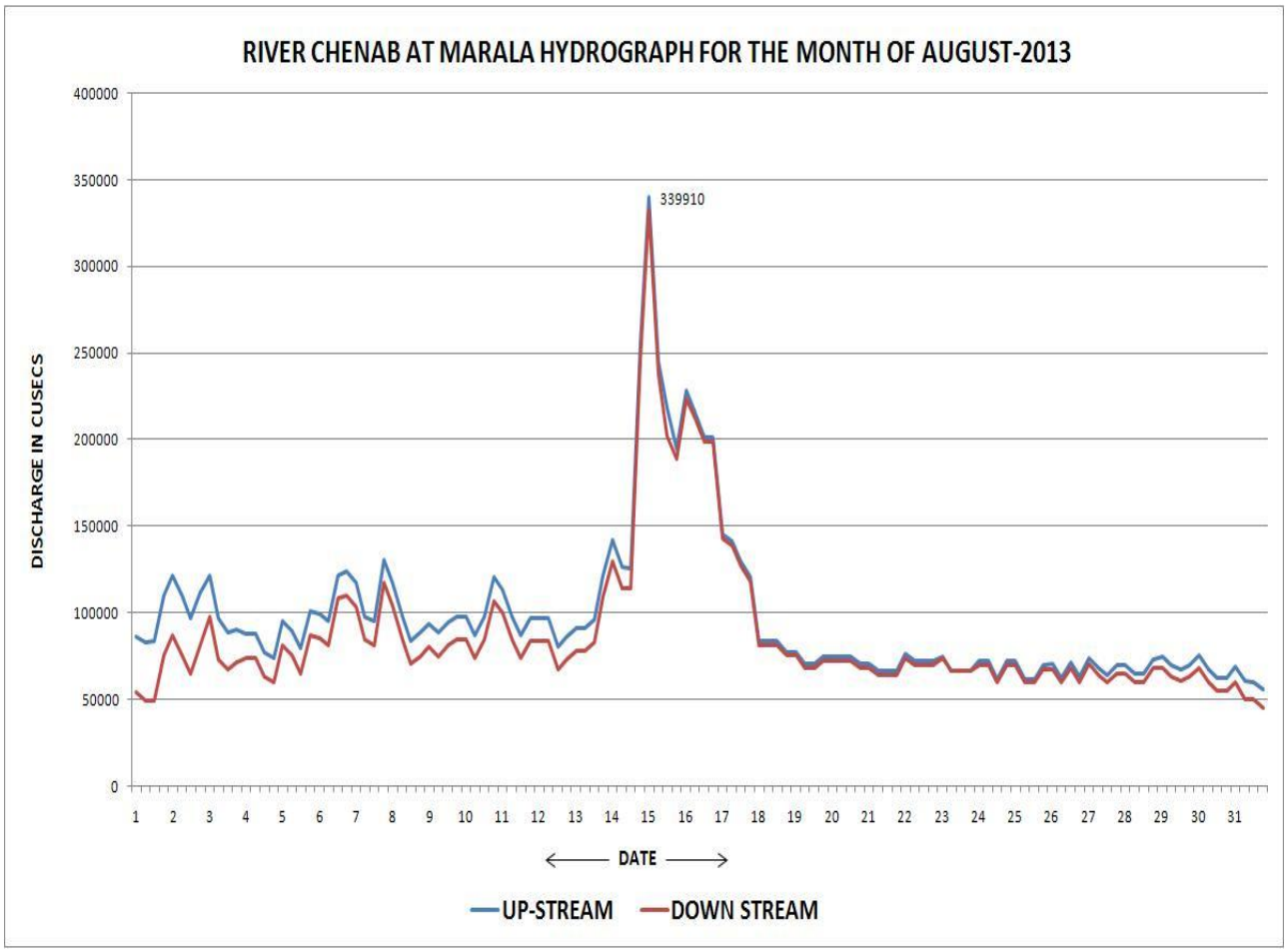


Figure54: Hydrograph at Marala (August -2013)

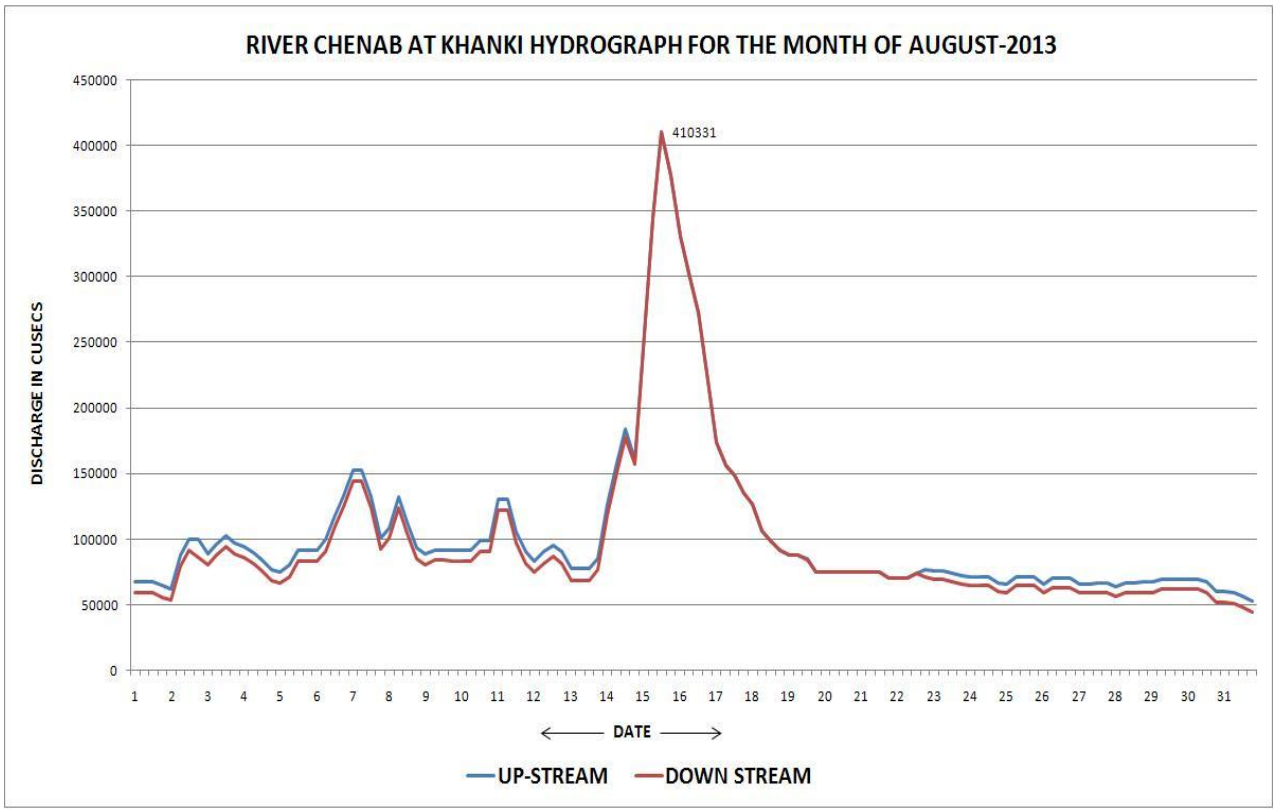


Figure 55: Hydrograph at Khanki (August -2013)

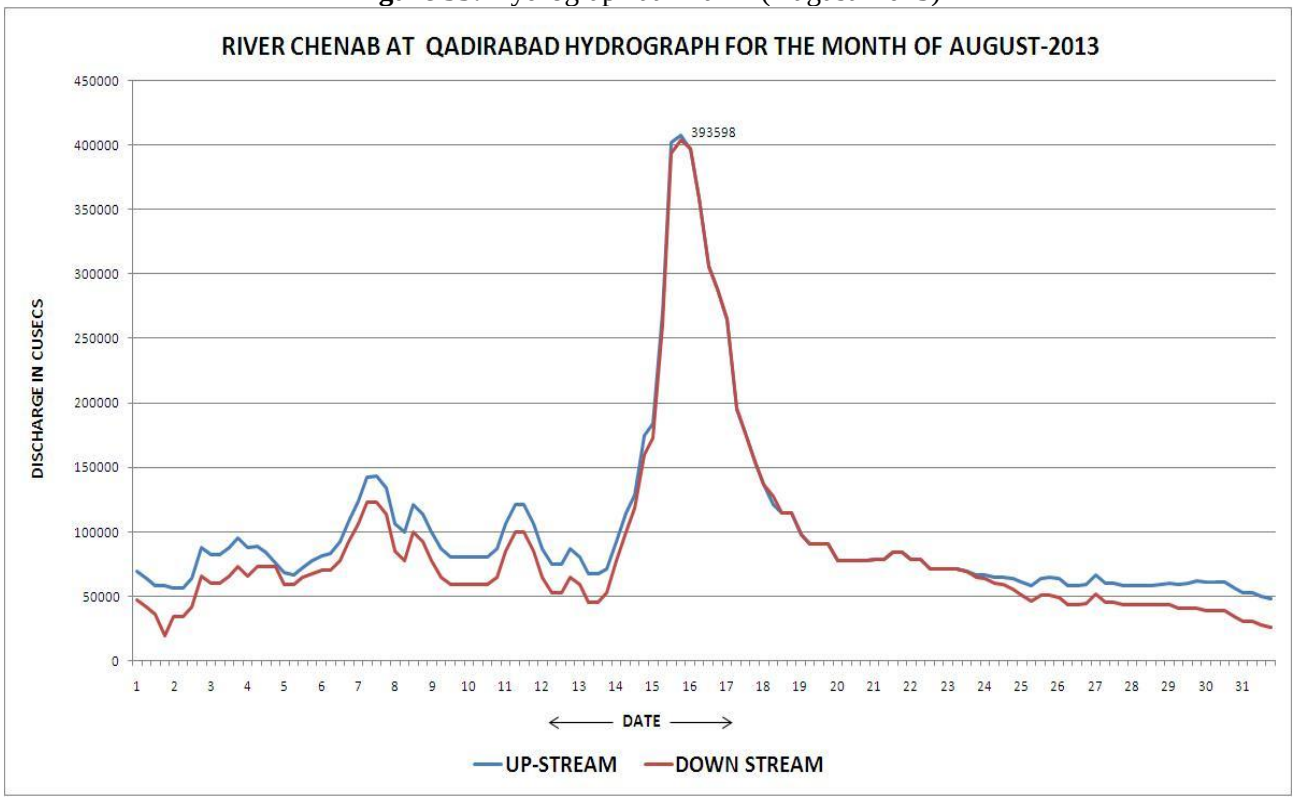


Figure 56: Hydrograph at Qadirabad (August -2013)

7 Seasonal Rainfall Pattern July to September 2013:

Seasonal rainfall pattern during the season is shown in figure below. Region of maximum precipitation (more than 1400 mm) is located over Islamabad in North Punjab; another region of Maximum precipitation (more than 1100 mm) is located over Sialkot in northeast Punjab. South West Baluchistan remained almost dry during the season.

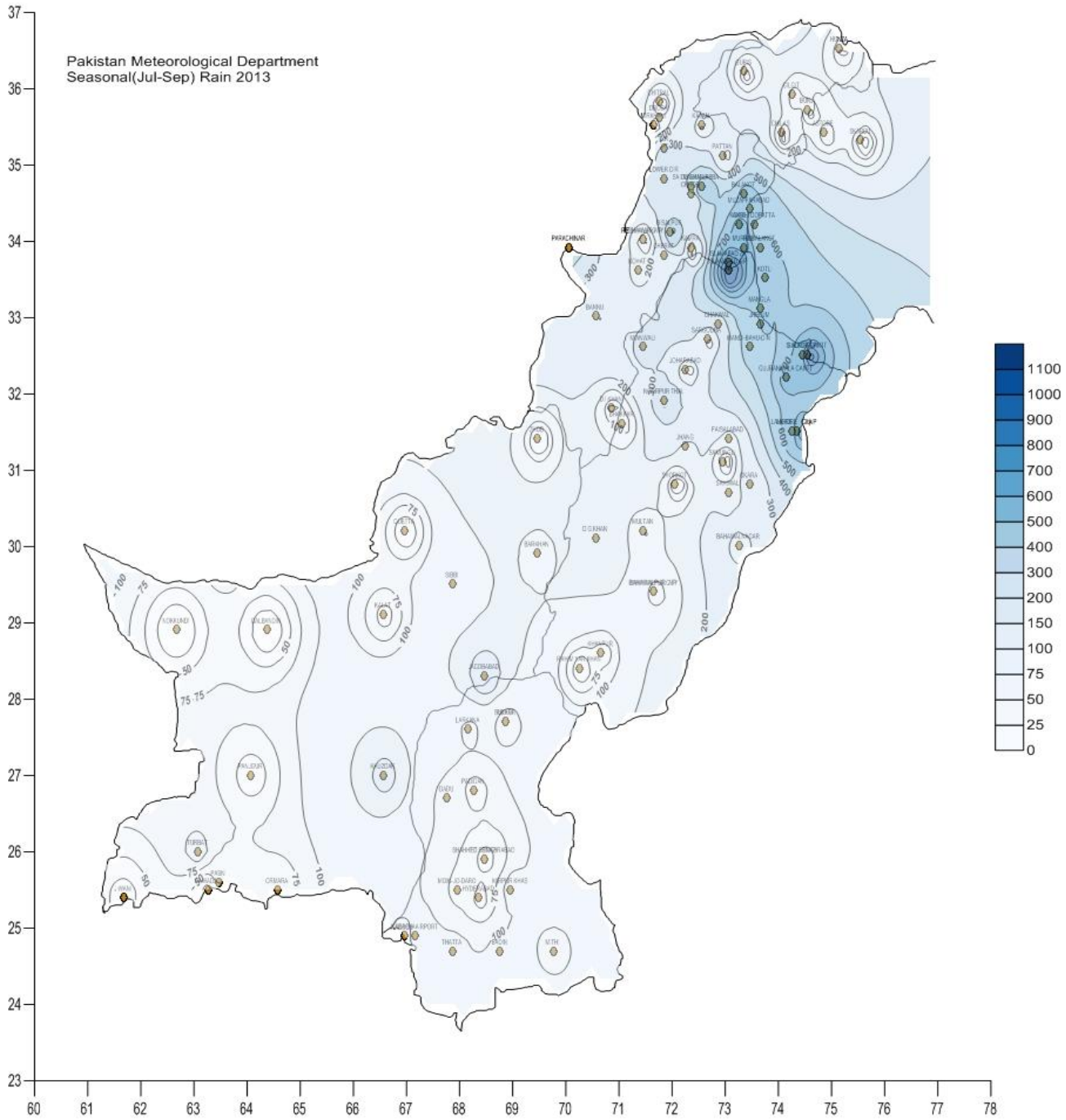


Figure 57: Seasonal Isohyetal Map (July-September-2013)

8 Seasonal Area Weighted Precipitation from July-September 2013:

The seasonal percentage departure precipitation map of monsoon 2013 indicates normal precipitation on all Pakistan basis and Kashmir. Baluchistan, Khyber Pakhtunkhwa, Punjab and Gilgit Baltistan received 11%, 13% ,9% and 12 % respectively above normal rainfall while Sindh received relatively less rainfall where precipitation remained 21% below normal as shown below.

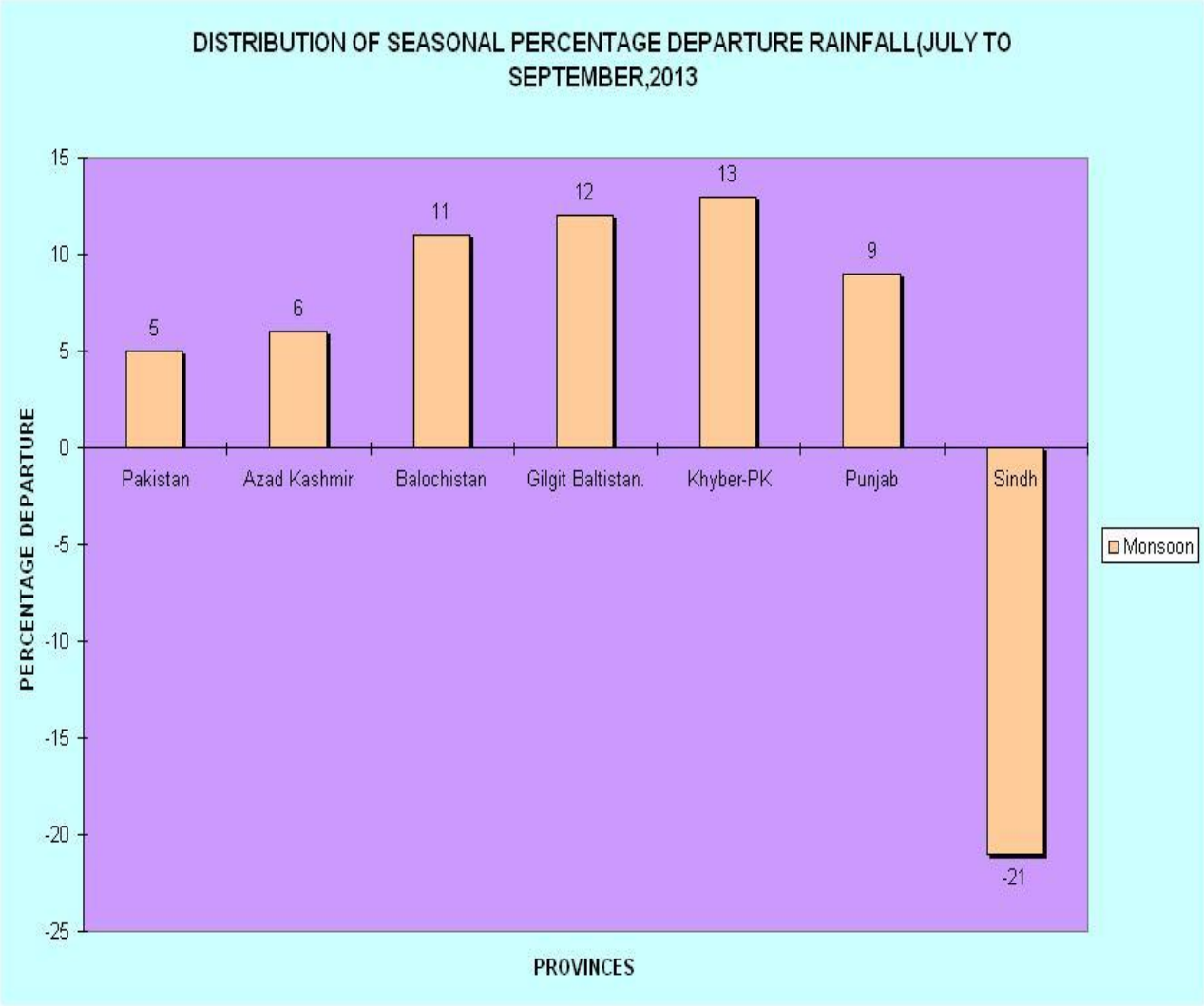


Figure 58: Seasonal Percentage Departure Map (July-September-2013)

9 Flood Forecast evaluation Report:

The Flood Forecast evaluation report for 2013 for each category of flood is given below:

Date	Stations	Peaks (Cusecs)	Time	Forecast issued	Percentage D.
15/6/2013	Mangla	76500	1800	60-90	100
21/6/2013	Kalabagh	262252	2359	215-250	95
27/6/2013	Kabul	102100	2359	80-90	88
27/6/2013	Marala	120935	1800	60-100	83
28/6/2013	Tarbela	276000	1200	270-290	100
8/7/2013	Mangla	83600	1800	50-80	96
9/7/2013	Tarbela	257000	600	240-280	100
10/7/2013	Kalabagh	299066	1800	270-310	100
20/7/2013	Marala	130447	2359	80R210	100
22/7/2013	Shahdara	40780	1200	35-45	100
23/7/2013	Tarbela	295000	1200	290-305	100
24/7/2013	Kalabagh	360112	1200	310-330	92
24/7/2013	Mangla	89000	900	55-75	84
24/7/2013	Marala	105424	2359	80-120	100
25/7/2013	Chashma	456164	2359	320-360	79
27/7/2013	Taunsa	348296	2359	320-400	100
30/7/2013	Mangla	180000	500	40-80	44
30/7/2013	Marala	150871	1800	180R250	83
30/7/2013	Khanki	132162	2359	180R250	73
31/7/2013	Qadirabad	120449	600	180R250	67
31/7/2013	Guddu	316176	1200	300-325	100
1/8/2013	Marala	121437	2359	90-140	100
2/8/2013	Marala	121836	2359	140 R 210	86
2/8/2013	Mangla	135000	300	70-110	81
3/8/2013	Chashma	476176	2359	370-450	95
4/8/2013	Shahdara	49840	1200	40-55	100

4/8/2013	Tarbela	349000	600	290-320	92
4/8/2013	Kabul	116400	2100	100-150	100
4/8/2013	Chashma	508345	2000	490-570	100
5/8/2013	Balloki	75975	600	65-75	100
5/8/2013	Kalabagh	402716	1200	420F300	96
6/8/2013	Mangla	95000	800	30-70	74
6/8/2013	Marala	123910	1800	120-180	100
6/8/2013	Taunsa	397521	2359	390R440	100
7/8/2013	Taunsa	415736	1500	390-430	100
7/8/2013	Marala	130884	1800	90-120	92
7/8/2013	Mangla	94500	1200	40-75	80
10/8/2013	Marala	120624	1800	90-130	100
13/8/2013	Mangla	179900	1800	150R400	100
13/8/2013	Marala	152690	2100	150-210	100
13/8/2013	Kalabagh	479603	1200	330-380	79
13/8/2013	Chashma	503459	1600	375-410	82
14/8/2013	Chashma	649689	2000	470-650	100
14/8/2013	Kalabagh	456734	1200	460-570	99
14/8/2013	Mangla	180000	1700	200R300	90
14/8/2013	Tarbela	392000	1800	300-340	87
14/8/2013	Kabul	144870	1400	90-160	100
15/8/2013	Kalabagh	460131	2359	450-540	100
15/8/2013	Kabul	135000	500	90-160	100
15/8/2013	Marala	377290	1900	400-500	94
15/8/2013	Marala	228810	2359	280-350	81
15/8/2013	Khanki	410331	1000	400-500	100
15/8/2013	Qadirabad	408878	1300	400-500	100
16/8/2013	Jassar	67700	1800	40-55	82
16/8/2013	Chashma	549926	800	500-600	100

16/8/2013	Taunsa	516017	1400	440-570	100
17/8/2013	Taunsa	516017	1200	470R570	100
17/8/2013	Shahdara	74880	2359	65-75	100
17/8/2013	Balloki	117770	2359	80-100	85
19/8/2013	Mangla	170000	2100	70-120	71
20/8/2013	Mangla	111000	1200	70-110	100
20/8/2013	Trimmu	272609	1800	220-260	96
20/8/2013	Guddu	567418	2359	500-575	100
23/8/2013	Sidhnai	87904	1800	70-90	100
22/8/2013	Sulemanki	82370	1800	82-90	100
24/8/2013	Sukkur	510875	600	510-530	100
25/8/2013	Islam	70932	600	56-70	100
25/8/2013	Punjnad	317261	600	280-320	100
30/8/2013	Kotri	381696	2359	325-350	92

R: Rising F: falling

The overall accuracy of the forecast issued by FFD, Lahore during the flood season -2013 has been calculated which shows a good 93% against all odds.

10 Flood limits (in lacs of cusecs):

RIVER	*SITE*	DESIGN CAPACITY	LOW	MED	HIGH	V.HIGH	EX.HIGH
KABUL	NOWSHERA	-	0.45	0.47	1.0	2.0	4.0
	WARSAK	15.0	0.30	0.45	1.0	2.0	4.0
INDUS	TARBELA	15.0	2.5	3.75	5.0	6.5	8.0
	ATTOCK	-	2.5	3.75	5.0	6.5	8.0
	KALABAGH	9.5	2.5	3.75	5.0	6.5	8.0
	CHASHMA	9.5	2.5	3.75	5.0	6.5	8.0
	TAUNSA	10.0	2.5	3.75	5.0	6.5	8.0
	GUDDU	12.0	2.0	3.5	5.0	7.0	9.0
	SUKKUR	9.0	2.0	3.5	5.0	7.0	9.0
	KOTRI	8.5	2.0	3.0	4.5	6.5	8.0
JHELUM	KOHALA	-	1.0	1.5	2.0	3.0	4.0
	MANGLA	10.6	0.75	1.1	1.5	2.25	3.0
	RASUL	8.5	0.75	1.1	1.5	2.25	3.0
CHENAB	MARALA	11.0	1.0	1.5	2.0	4.0	6.0
	KHANKI	8.0	1.0	1.5	2.0	4.0	6.0
	QADIRABAD	8.07	1.0	1.5	2.0	4.0	6.0
	TRIMMU	6.45	1.5	2.0	3.0	4.5	6.0
	PANJNAD	7.0	1.5	2.0	3.0	4.5	6.0
RAVI	JASSAR	2.75	0.5	0.75	1.0	1.5	2.0
	RAVI SYPHON	4.5	0.4	0.65	0.9	1.35	1.8
	SHAHDARA	2.5	0.4	0.65	0.9	1.35	1.8
	BALLOKI	2.25	0.4	0.65	0.9	1.35	1.8
	SIDHNAI	1.5	0.3	0.46	0.6	0.9	1.3
SUTLEJ	SULEMANKI	3.25	0.5	0.8	1.2	1.75	2.25
	ISLAM	3.0	0.5	0.8	1.2	1.75	2.25

s – 2013