Supplementary Material

Flood Hazard Assessment for the Tori Levee Breach of the Indus River Basin, Pakistan

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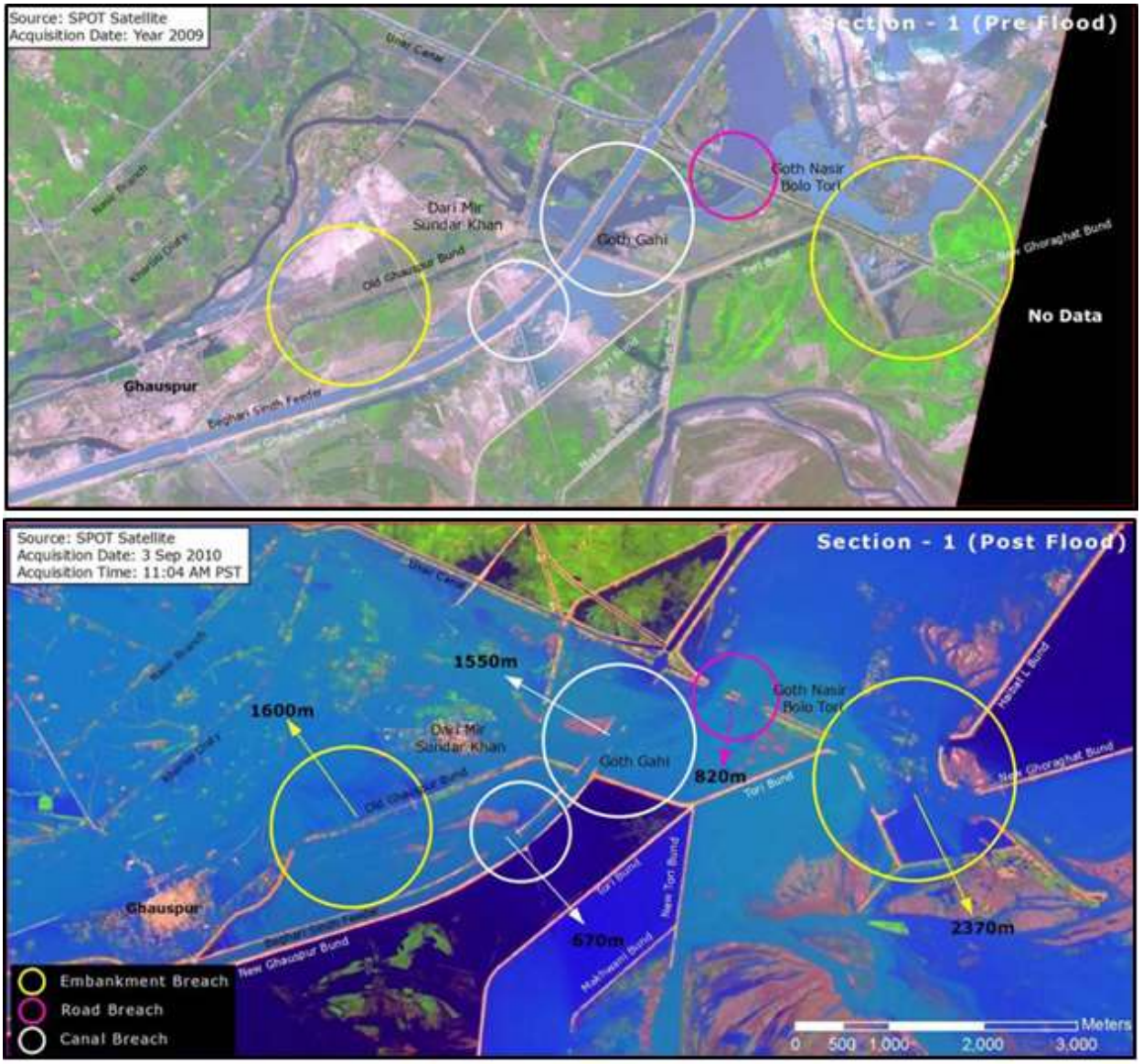

Figure S1. Pre-flood (top), post-flood or breached (bottom) situation of Tori Levee images obtained from SPOT.

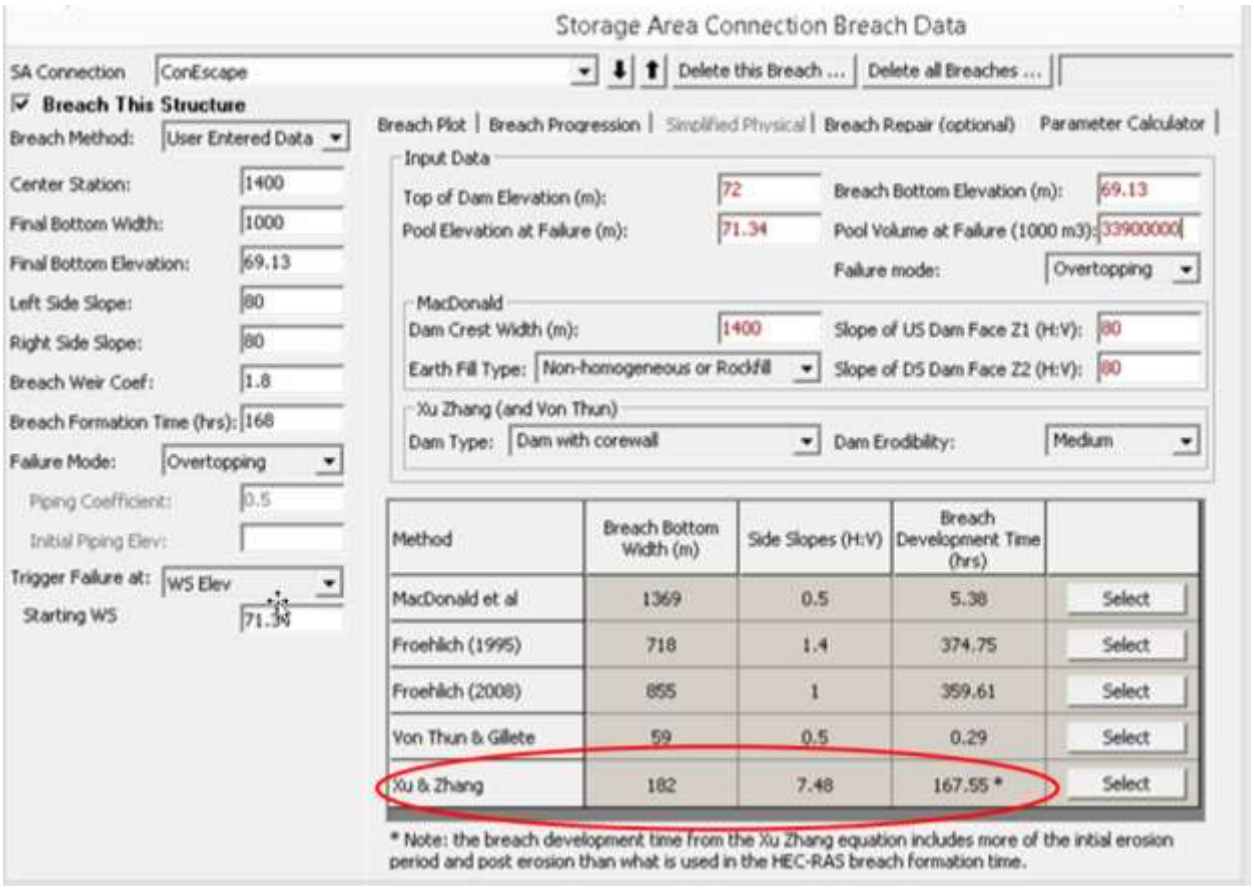

Figure S2. Estimation of dam crest width using Xu and Zhang method for Tori Levee breach.

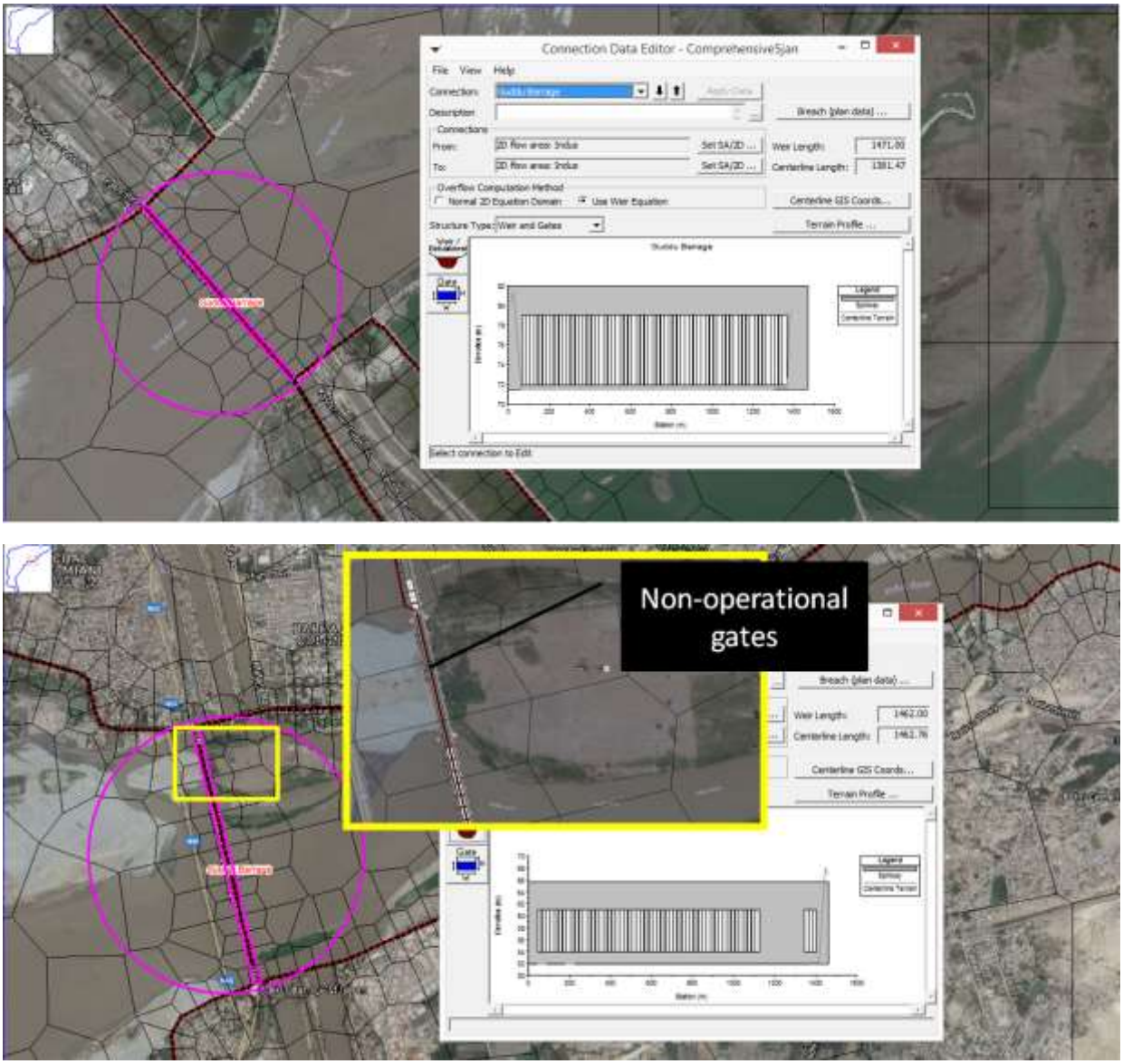

Figure S3. Design of Guddu Barrage structure in HEC-RAS. Upper Figure shows the modelling of gates at Guddu Barrage, low Figure shows operational and non-operational gates at Guddu Barrage.

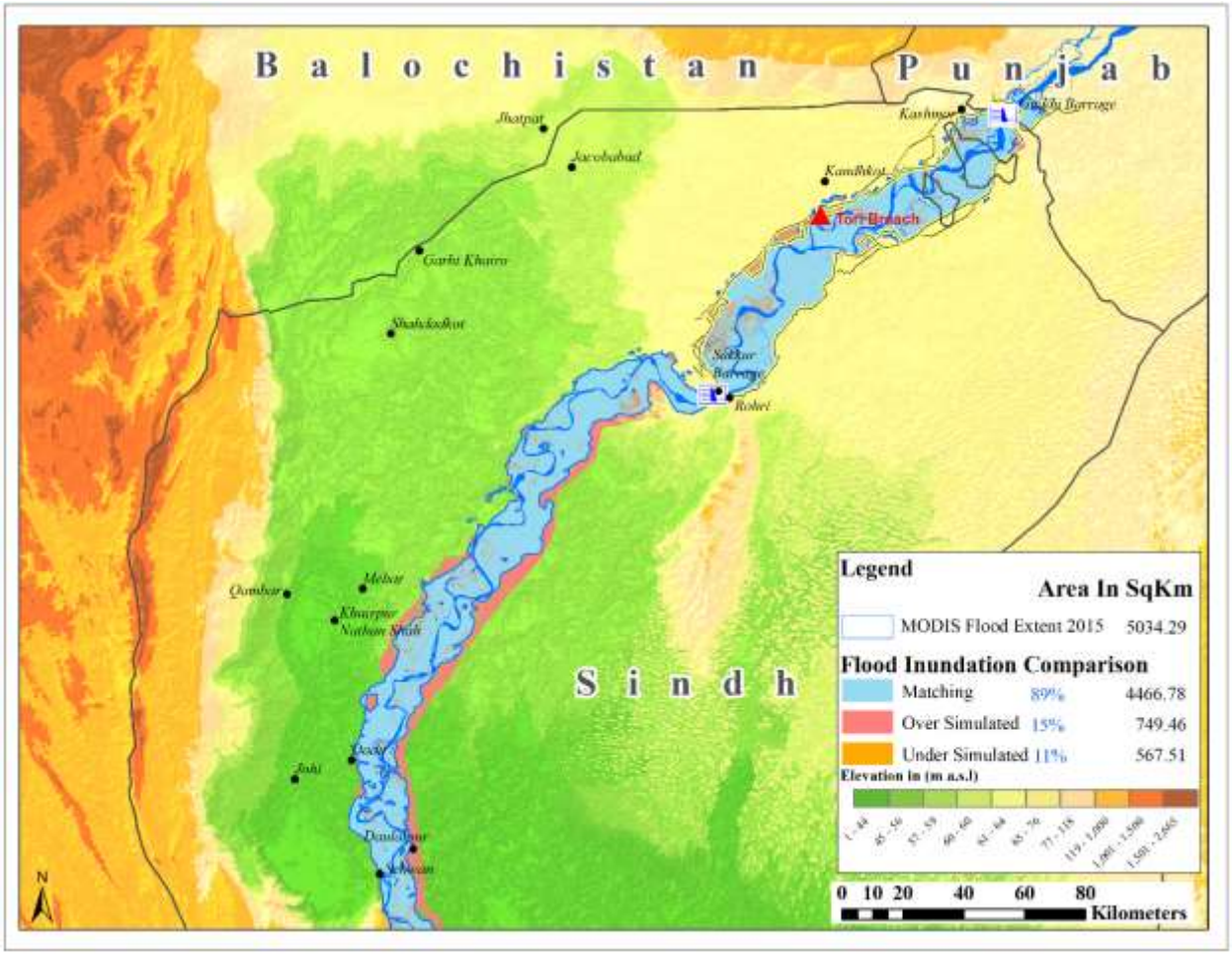

Figure S4. The validation of HEC-RAS model for maximum flood inundation comparison of 2015 flood map by comparing remotely sensed and simulated flood extents.

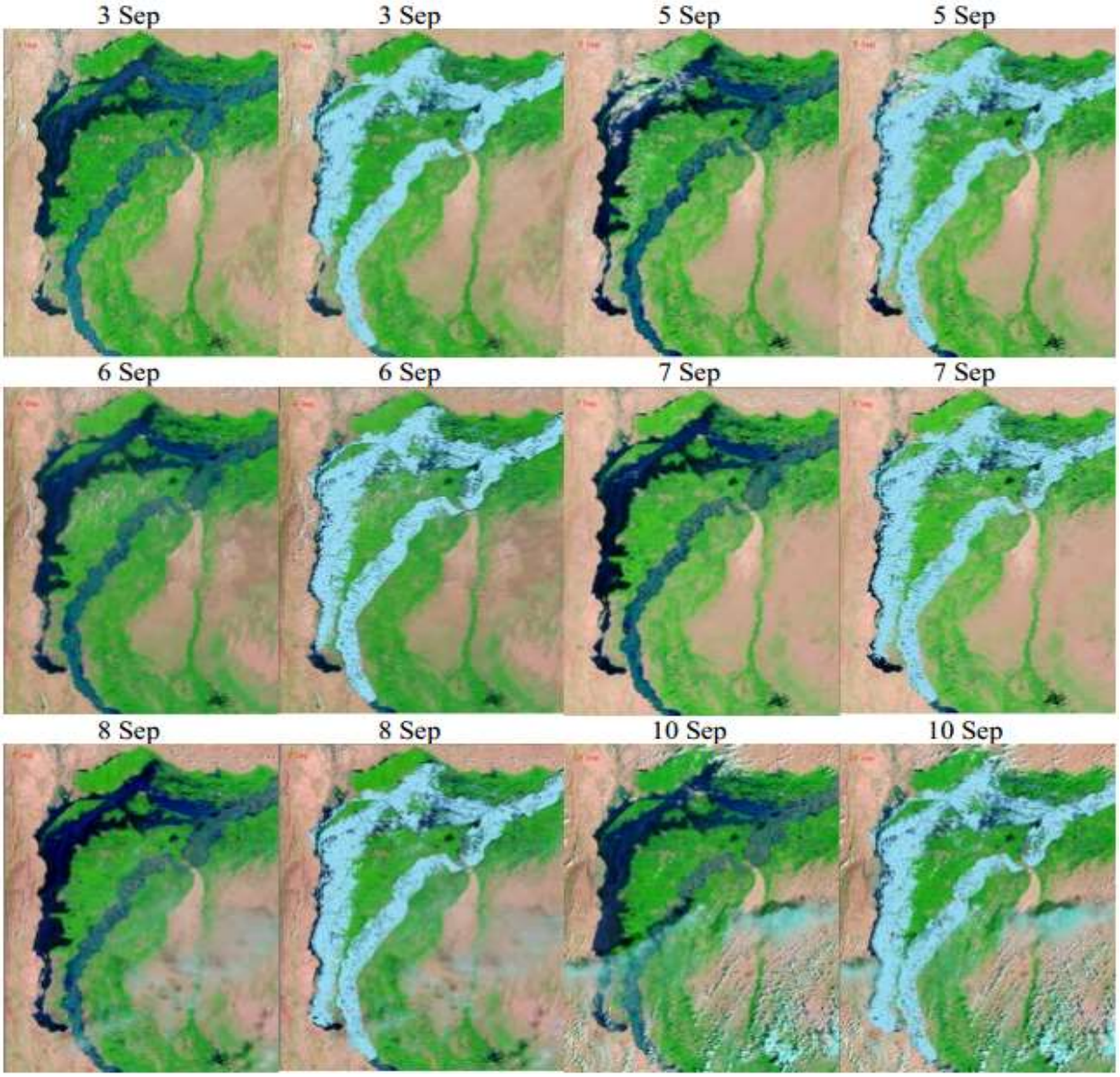

Figure S5. Sample comparison of flood extent in flood plain between MODIS daily images and simulated by HEC-RAS model during 03 to 12 September 2010 flood.

Table S1. Comparison of daily observed and simulated flood extents based on MODIS images of the 2010 flood event.

Date	MODIS Flood Extent	Simulated Flood Extent	Matching Area "M"	Over Simulated "O"	Under Simulate "U"	Matching Area	Over Simulation	Under Simulation	Measure of Fit "F"
	Area in km^2					Percentage			
10-Aug	5136.0	5914.9	4190.7	1724.1	945.2	82%	34%	18%	61%
11-Aug	5421.4	6197.9	4463.5	1734.5	957.9	82%	32%	18%	62%
12-Aug	5426.0	6467.9	4086.0	2381.9	1339.9	75%	44%	25%	52%
13-Aug	6719.5	6768.6	5359.9	1408.7	1359.6	80%	21%	20%	66%
17-Aug	7180.5	7992.8	6165.3	1827.5	1015.1	86%	25%	14%	68%
18-Aug	4816.6	8307.0	3787.7	4519.3	1029.0	79%	94%	21%	41%
20-Aug	7468.6	8891.1	5907.5	2983.6	1561.1	79%	40%	21%	57%
22-Aug	9542.5	9504.9	7877.7	1627.2	1664.8	83%	17%	17%	71%
23-Aug	10099.6	9782.7	8366.6	1416.1	1733.1	83%	14%	17%	73%
27-Aug	11172.4	10950.7	9179.3	1771.4	1993.1	82%	16%	18%	71%
29-Aug	10168.4	11376.8	8614.5	2781.1	1553.9	85%	27%	15%	67%
3-Sep	11828.3	12071.5	9189.5	2882.0	2638.8	78%	24%	22%	62%
5-Sep	11063.5	12169.8	8403.8	3766.0	2659.7	76%	34%	24%	57%
6-Sep	11355.6	12216.9	8608.6	3608.4	2747.0	76%	32%	24%	58%
7-Sep	10912.9	12230.5	8300.9	3929.6	2612.0	76%	36%	24%	56%
8-Sep	10775.4	12251.1	8010.0	4241.0	2765.4	74%	39%	26%	53%
10-Sep	11376.5	12103.9	8330.7	3773.2	3045.7	73%	33%	27%	55%
12-Sep	11690.6	11923.7	8386.0	3537.7	3304.6	72%	30%	28%	55%
13-Sep	11755.6	11829.9	8357.5	3472.4	3398.0	71%	30%	29%	55%
15-Sep	9108.1	11591.0	6566.9	5024.2	2541.3	72%	55%	28%	46%
16-Sep	9350.4	11447.8	6645.7	4802.1	2704.7	71%	51%	29%	47%
17-Sep	9180.2	11289.5	6349.7	4939.8	2830.5	69%	54%	31%	45%
18-Sep	11755.6	11122.1	7880.6	3241.5	3875.0	67%	28%	33%	53%
19-Sep	11837.8	10953.7	7811.5	3142.2	4016.9	66%	27%	34%	52%
21-Sep	12034.6	10614.2	7746.0	2868.3	4288.6	64%	24%	36%	52%
22-Sep	11909.1	10422.9	7560.6	2862.4	4348.6	63%	24%	37%	51%
Average Percent						**76%**	**34%**	**24%**	**57%**