

1 Q. D-43; Volume I: Install Hydrometeorological Stations, page D-47, Hydro states: *"In*  
2 *2009, the second year of the program, meteorological stations were installed at*  
3 *the Burnt Dam Spillway and the Hinds Lake Control Structure as approved by*  
4 *Board No. P.U. 36(2008). Installation of a third station at Victoria Reservoir was*  
5 *postponed, because it was to include a second snow water equivalent sensor. It*  
6 *was prudent to ensure successful operation of the first installation before*  
7 *deploying the technology at additional sites. The 2010 program was to include*  
8 *additional snow sensors and was also postponed pending additional experience*  
9 *with the Cat Arm installation."*

10 Please describe the lessons learned by Hydro from the completion of this program  
11 thus far.

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14 A. Hydro developed a program to increase the hydrometeorological station network in  
15 its watersheds in 2008. Since that time six stations have been installed as follows:

- 16 • Cat Arm intake in 2008;
- 17 • Long Pond intake in 2008;
- 18 • Ebbegunbaeg in 2008;
- 19 • Cat Arm reservoir in 2009 (including snow water equivalent sensor);
- 20 • Hinds Lake control structure in 2009; and
- 21 • Burnt Dam spillway in 2009.

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23 A summary of the data collected to date is presented in Figures 1 to 3.

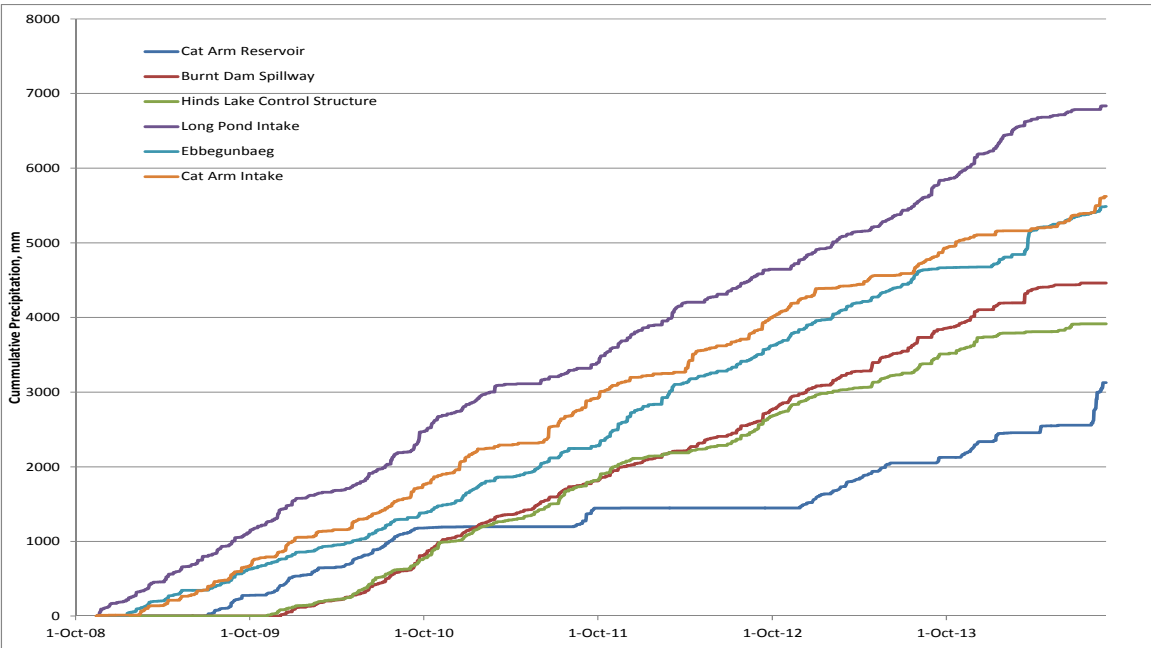


Figure 1 Cumulative Precipitation Data for Period of Record

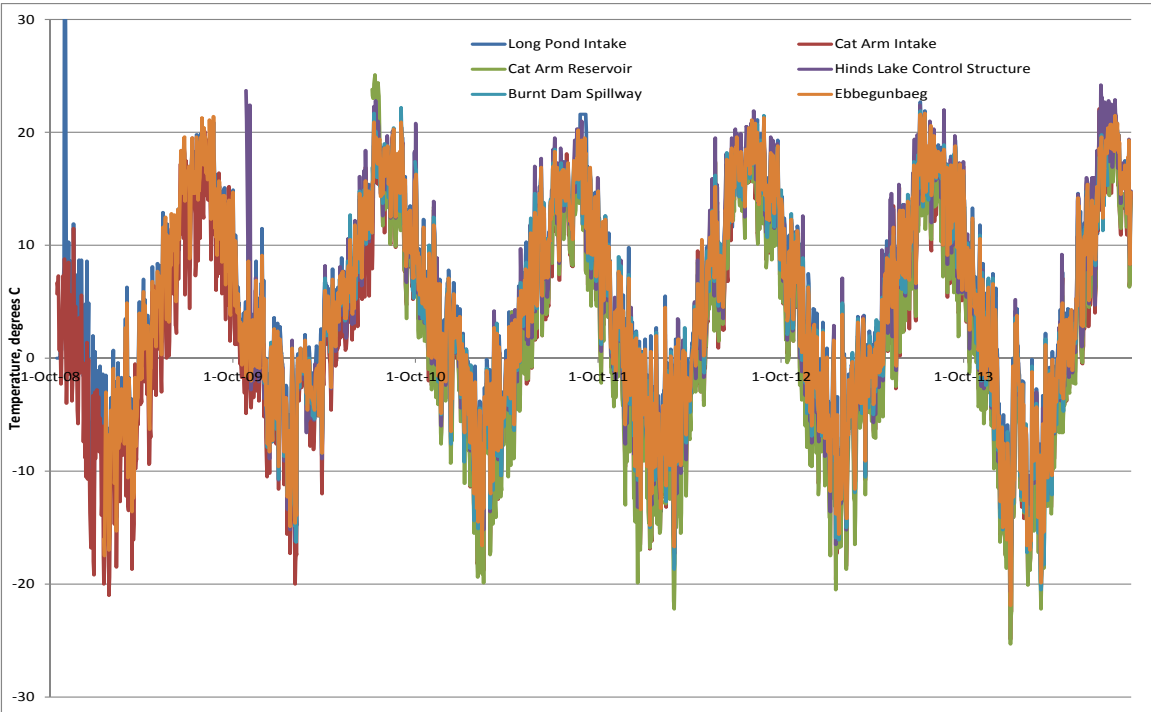
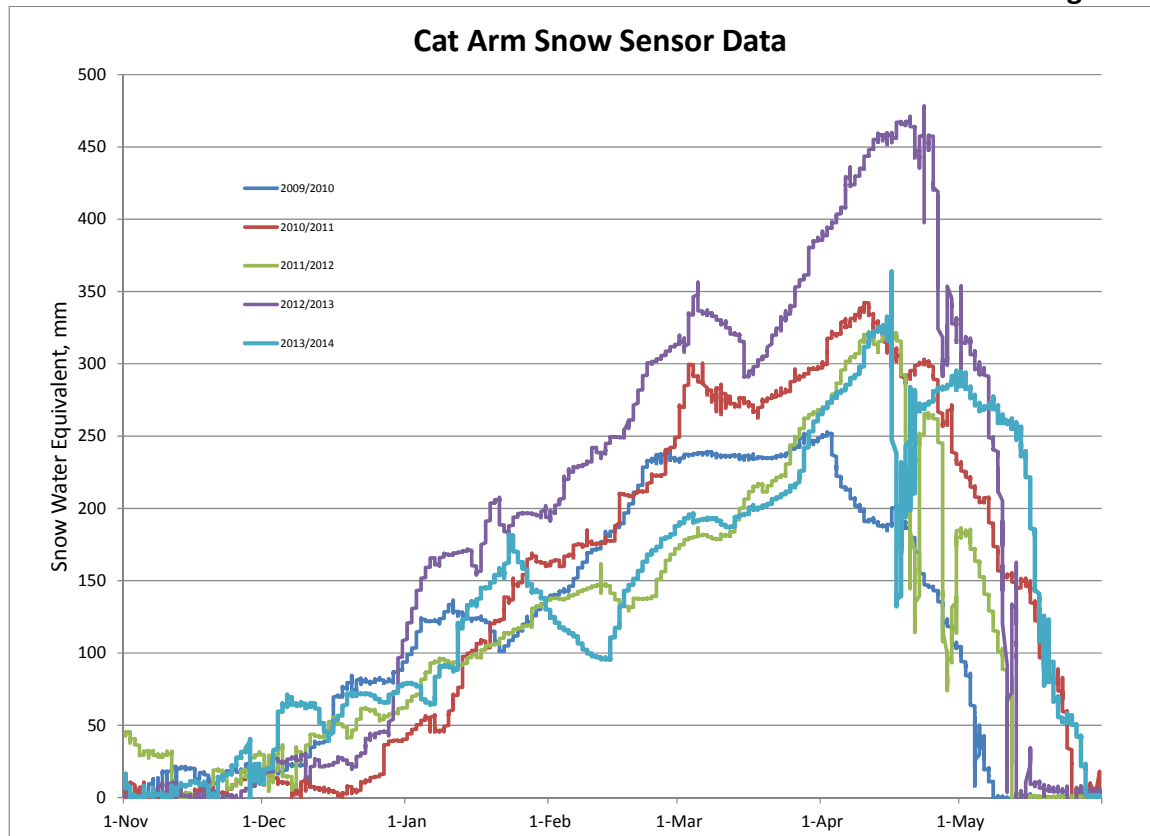


Figure 2 Temperature Data for Period of Record



**Figure 3 Snow Water Equivalent Data for Period of Record**

The value of the hydrometeorological data that Hydro collects, and the analyses that have been done on it, is as follows:

1. The temperature and precipitation data are automatically input to Hydro's Decision Support Software and are used, at least weekly, to estimate inflow to the basins. The estimated inflows are then used to optimize operation of the hydroelectric system and minimize the use of thermal generation;
2. During periods of high water levels in Hydro's reservoirs, System Operations staff uses the real time precipitation data to predict the rate of rise of the reservoirs and assist in spillway gate operations and issuing of public safety advisories;

3. Five years of snow water equivalent data have now been collected at the Cat Arm sensor. The data are used to judge how fast snow is accumulating and melting and the relative depth of the snowpack from year to year. Knowledge of the snowmelt is essential in operating the reservoirs during the spring runoff to maximize water in storage while minimizing spill; and
4. Real time temperature data are used to judge whether precipitation falling in the basin is falling as snow or as rain and whether snow will be accumulating or melting. This information assists in predicting runoff into the reservoirs.

A formal lessons learned exercise has not been conducted on the program; however, observations have been made as follows:

1. There is a tradeoff between remoteness and data quality. It is necessary to have stations in remote locations to understand the climate across the large basins; however, due to helicopter scheduling, there can be significant delays before staff can make appropriate repairs, if required;
2. Comparison of the precipitation data at Hydro's gauges to the inflows calculated for the basins suggests that Hydro's precipitation gauges, in general, under catch (i.e. record less rain or snow than actually falls). This finding was not unexpected; it is known that Environment Canada stations also under catch. Sometimes the under catch is related to gauge malfunction and zero values, but it is also likely that the gauges do not record accurately during periods of heavy rain and snow. It is still valuable to know that precipitation has occurred, even if the total may be under recorded. The data confirm that some rain events are highly localized. In some events, gauges that are in adjacent basins can record very different precipitation totals; and

- 1                    3. The data confirms that temperature data is of much better quality than  
2                    precipitation data. The temperature gauges seem less likely to  
3                    malfunction and agreement between adjacent Hydro and Environment  
4                    Canada gauges is better.