

ALBERTA HAIL SUPPRESSION PROJECT
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If no seeding was expected within the next few hours after briefing (*i.e.* clear skies), flight crews were put on telephone standby. If operations were likely within the next few hours or actively growing cumulus were present, then crews were put on Airport Standby immediately following the briefing. During briefing, one crew at each site was always designated as “first up” or the first aircraft to be called if needed. Weather conditions and aircraft maintenance dictated which crews will be first up on any given day. If ceilings were very low, top seeders were designated as first up. If an aircraft was scheduled for maintenance, even if routine, then it would not be first up since it may have delays in launch time. When not on airport standby, crews were on telephone standby (maximum 60 minutes from airport) at any time unless consulting with the project manager or meteorologists.

11.5 THE CONVECTIVE DAY CATEGORY (CDC)

The daily weather forecast established the Convective Day Category (CDC) that best described the conditions that were expected for each day. The CDC (Strong 1979) is an index that gives the potential for hailstorm activity and thus seeding operations. A description of the weather conditions for each CDC is given in Table 7. The distinction between the -2 and -1 category is sometimes difficult, since overcast or prolonged rains eventually break up into scattered showers. The maximum vertically-integrated liquid (VIL) recorded by TITAN is used for forecast verification of hail size in the absence of surface hail reports. Radar VIL values are used within the project area or buffer zones on the north, east, and south sides (not including the mountains or foothills of the western buffer zone). This may have increased the number of declared hail days from the early project years, which relied on a human report of hail fall at the surface; however, it is believed to be a more realistic measure of hail. The +1 category minimum hail size is assumed to be 5 mm since this is a common minimum size for hail used by numerical modelers, and also the recognized size threshold for hail. Smaller ice particles, those less than 5 mm diameter, are generally called snow pellets or graupel.

Convective Day Category (CDC)

| CDC | Strategy | Description |
|-----|---------------------------------------|---|
| -3 | No Seed | Clear skies, fair weather cumulus, or stratus (with no rain). No deep convection. |
| -2 | No Seed | Towering cumulus, altocumulus, alto-stratus, or nimbostratus producing rain for several hours or weak echoes (<i>e.g.</i> virga). |
| -1 | No Seed | Scattered convective rain showers but no threat of hail. No reports of lightning. |
| 0 | Patrol flights and potential seeding. | Thunderstorms (at least one) but no hail. VIL < 20 kg/m ² within the project area or buffer zones on north, east, and south sides. |
| +1 | Seed | Thunderstorms with pea or shot size hail (0.5 to 1.2 cm diameter). 20 kg/m ² < VIL < 30 kg/m ² |
| +2 | Seed | Thunderstorms with grape size hail (1.3 to 2.0 cm diameter). 30 kg/m ² < VIL < 70 kg/m ² |
| +3 | Seed | Thunderstorms with walnut size hail (2.1 to 3.2 cm diameter). 70 kg/m ² < VIL < 100 kg/m ² |
| +4 | Seed | Thunderstorms with golf ball size hail (3.3 to 5.2 cm diameter). VIL > 100 kg/m ² |
| +5 | Seed | Thunderstorms with greater than golf ball size hail (>5.2 cm diameter). |

Table 7. The Convective Day Category (CDC).

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Various meteorological parameters were also forecast in addition to the CDC. These parameters were used in developing a seeding strategy and were passed on to pilots during the weather briefing. The meteorological parameters were recorded each day and archived for future analysis.

11.6 METEOROLOGICAL STATISTICS

A complete listing of the daily meteorological statistics is given in Appendix I. A summary of the important daily atmospheric parameters used as inputs for the daily forecast of the CDC and threat of hail is given in Table 8. Hail days are defined by either a report of hail at the surface or by a vertically-integrated-liquid water (VIL) measurement from the radar of at least 30 kg/m².

Summary of Daily Atmospheric Parameters

| Parameter | For All Days (107) | | | | For Hail Days Only (69) | | | |
|-------------------------------------|---------------------------|---------------|------------|------------|--------------------------------|---------------|------------|------------|
| | Avg | StdDev | Max | Min | Avg | StdDev | Max | Min |
| Forecast CDC | 0.9 | 1.7 | 4 | -3 | 1.6 | 1.2 | 4 | -1 |
| Observed CDC | 0.9 | 1.9 | 5 | -3 | 2 | 1.1 | 5 | 1 |
| Precipitable Water (inches) | 0.8 | 0.2 | 1.2 | 0.3 | 0.9 | 0.2 | 1.2 | 0.5 |
| 0°C Level (kft) | 11.1 | 1.6 | 14.0 | 5.7 | 11.3 | 1.45 | 14.0 | 8.2 |
| -5°C Level (kft) | 13.6 | 1.7 | 16.6 | 7.9 | 13.8 | 1.5 | 16.1 | 10.6 |
| -10°C Level (kft) | 16.2 | 1.7 | 19.3 | 11.1 | 16.4 | 1.5 | 18.7 | 12.6 |
| Cloud Base Height (kft) | 8.4 | 1.6 | 12.4 | 4.5 | 8.1 | 1.4 | 12.4 | 5.4 |
| Cloud Base Temp (°C) | 6.2 | 3.9 | 13.5 | -9.3 | 7.4 | 3.2 | 13.5 | 0.4 |
| Maximum Cloud Top Height (kft) | 30.9 | 7.5 | 40.7 | 7.4 | 33.9 | 4.1 | 40.7 | 21.0 |
| Temp. Maximum (°C) | 21.0 | 3.8 | 29.5 | 8 | 21.3 | 3.4 | 29.5 | 14.0 |
| Dew Point (°C) | 10.1 | 3.6 | 16 | -4 | 11.2 | 3.1 | 16.0 | 3.7 |
| Convective Temp (°C) | 21.0 | 4.2 | 30.9 | 9.2 | 21.2 | 3.8 | 30.1 | 13.5 |
| Conv. Avbl. Potential Energy (J/kg) | 751.2 | 506 | 1853 | 0 | 977.4 | 444 | 1853 | 132 |
| Total Totals | 53.4 | 3.6 | 60.1 | 39.2 | 54.7 | 2.3 | 60.1 | 49.5 |
| Lifted Index | -2.6 | 2.4 | 7 | -6 | -3.6 | 1.4 | -1.0 | -6.0 |
| Showalter Index | -1.6 | 2.5 | 7.9 | -5.7 | -2.7 | 1.6 | -0.2 | -5.7 |
| Cell Direction (deg) | 248 | 81 | 357 | 0 | 241 | 80.7 | 357 | 0 |
| Cell Speed (knots) | 19.3 | 8.4 | 40 | 1 | 18.3 | 8.1 | 35 | 1 |
| Storm Direction (deg) | 255 | 95 | 353 | 2 | 242 | 95.4 | 353 | 7 |
| Storm Speed (knots) | 13.1 | 5.7 | 27 | 1 | 12 | 5.5 | 24 | 1 |
| Low Level Wind Direction (deg) | 249 | 75 | 360 | 8 | 239 | 78.8 | 360 | 8 |
| Low Level Wind Speed (knots) | 15.5 | 7.2 | 34 | 2 | 14.2 | 7.2 | 34 | 2 |
| Mid-Level Wind Direction (deg) | 254 | 69 | 360 | 10 | 245 | 68.4 | 360 | 21 |
| Mid-Level Wind Speed (knots) | 23.5 | 10.7 | 51 | 2 | 21.5 | 10.2 | 48 | 2 |
| High Level Wind Direction (deg) | 241 | 73 | 355 | 16 | 235 | 65 | 355 | 42 |
| High Level Wind Speed (knots) | 43.5 | 20.9 | 104 | 4 | 39.7 | 18.4 | 101 | 4 |

Table 8. Summary of Daily Atmospheric Parameters.

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The statistics exclusively for hail days are provided in the rightmost four columns of Table 8. During the 2016 season, hail was observed or detected by radar on 69 of the 107 project days, or 64% of all days. Table 8 reveals what one would expect: hail is more common when moisture (precipitable water) is greater, when stability is less (Lifted Index), and when convective available potential energy, or CAPE, is greater. An interesting note is that though a CDC of +5 was never forecast in 2016, four +5 days occurred. However, on the four +5 CDC days, hail was forecast every time. The forecasting for the season is examined in greater detail in the following section.

11.7 FORECASTING PERFORMANCE

The following tables indicate the forecasting performance for the summer season with respect to the forecast and observed weather conditions as defined by the “Convective Day Category” or CDC within the project area. A CDC greater than zero indicates hail. The forecasts were verified by the weather observations as reported by Environment Canada, crop insurance reports received from the Agriculture Financial Services Corporation in Lacombe, and also by public reports of hail in the press, radio, television, and social media, as well as by the reports from project personnel. The Vertical Integrated Liquid (VIL) radar parameter was also used as a verification tool, but secondary to actual hail reports. The CDCs forecast compared to those actually observed in 2016 are summarized in Table 9.

| | | Observed Days | | |
|----------------------|----------------|----------------------|-------------|---------------|
| | | No Hail | Hail | Totals |
| Forecast Days | No Hail | 28 [26%] | 14 [13%] | 42 [39%] |
| | Hail | 10 [9%] | 55 [51%] | 65 [61%] |
| Totals | | 38 [36%] | 69 [64%] | 107 |

Table 9. Comparison of CDCs Forecasts & Observations.

In 2016, hail fell within the project area on 69 of 107 days (64%), leaving 38 days without hail (36%). The forecast was correct in forecasting “hail” on 55 of 69 observed hail days (80%) and failed to forecast hail on 14 hail days (20%). Of the fourteen “misses”, days on which hail occurred but was not forecast, the hail was small (CDC of +1) for nine of them, and on the other five only +2. The forecast was correct in forecasting “no-hail” on 28 of 38 observed no-hail days (74%). The forecast incorrectly forecast hail (false alarms) on 10 of the 38 days when no-hail was observed (26%). The WMI meteorologists did an excellent job with forecasting large hail in 2016 and didn’t miss any of the significant hail days.

The Heidke Skill Score (HSS) for WMI this past year (from Table 10) was 0.52, down slightly from 0.63 in 2015. The HSS varies from -1 for no skill to +1 for perfect forecasts. The forecasting skill is considered significant if HSS is greater than 0.4, which was again significantly exceeded in 2016.

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| | 2016 | 2015 | 2014 | 2013 | 2012 | 2011 | 2010 | 2009 | 2008 | 2007 | 2006 | 2005 | 2004 | 2003 | 2002 |
|----------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| POD (Hailcast) | .91 | .81 | .85 | .89 | .75 | .72 | .77 | .91 | .80 | .82 | .69 | .84 | .91 | .76 | .81 |
| POD (WMI) | .80 | .87 | .90 | .97 | .98 | .85 | .85 | .83 | .68 | .76 | .69 | .61 | .60 | .86 | .83 |
| FAR (Hailcast) | .20 | .39 | .19 | .15 | .22 | .21 | .31 | .29 | .35 | .30 | .31 | .45 | .47 | .56 | .34 |
| FAR (WMI) | .15 | .26 | .19 | .18 | .23 | .13 | .14 | .13 | .20 | .11 | .14 | .18 | .30 | .16 | .33 |
| HSS (Hailcast) | .23 | .43 | .35 | .66 | .51 | .49 | .46 | .44 | .43 | .46 | .35 | .31 | .39 | .33 | .56 |
| HSS (WMI) | .52 | .63 | .66 | .67 | .68 | .65 | .72 | .63 | .49 | .66 | .55 | .42 | .51 | .63 | .59 |
| CSI (Hailcast) | .74 | .54 | .71 | .77 | .62 | .64 | .56 | .45 | .52 | .50 | .42 | .40 | .51 | .39 | .57 |
| CSI (WMI) | .70 | .67 | .74 | .80 | .76 | .75 | .73 | .56 | .52 | .62 | .53 | .42 | .49 | .59 | .59 |

Table 10. Probability of Detection (POD), False Alarm Ratio (FAR), Heidke Skill Score (HSS) and Critical Success Index (CSI) performance of Hailcast and WMI from 2002 to 2016.

The Critical Success Index (CSI) is the ratio of the successful hail forecasts divided by the sum of all hail forecasts plus the busts. The CSI does not incorporate the null event (no-hail forecast and no-hail observed), and is also a popular measure of the skill of forecasts. The CSI for WMI this past season was 0.70, compared to 0.67 for 2015.

Comparisons of the CDCs that were forecast and observed on a daily basis are made in Table 11. The exact forecast weather type (CDC) was observed on 41 of 107 days or 38% of the time. The forecast was correct to within one CDC category on 83 days or 78% of the time. There were five days when, according to the radar-estimated VIL, grape-size hail was indicated inside the project boundaries when hail was not forecast (not necessarily over a protected city). There were no days when hail larger than grapes fell and was not forecast. There were no “surprise storms” this season.

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Observed Convective Day Category (CDC) 2016

Green shading indicates that the forecast and observed CDCs were the same (perfect forecasts).
 Gray shading indicates that the observed CDC was greater than those forecast (underforecasts).
 Blue shading indicates that the observed CDCs were less than those forecast (overforecasts).

| | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 | 5 | |
|----|----|----|----|----|----|----|---|---|---|-----|
| -3 | 4 | | | | | | | | | 4 |
| -2 | 4 | 4 | 1 | 1 | | | | | | 10 |
| -1 | | 1 | 3 | 1 | 2 | 1 | | | | 8 |
| 0 | | | 4 | 5 | 7 | 4 | | | | 20 |
| 1 | | | 1 | 2 | 7 | 5 | 1 | | | 16 |
| 2 | | 1 | | 6 | 6 | 14 | 3 | 1 | 1 | 32 |
| 3 | | | | | 3 | 5 | 4 | 1 | 2 | 15 |
| 4 | | | | | | | 1 | 0 | 1 | 2 |
| 5 | | | | | | | | | 0 | 0 |
| | 8 | 6 | 9 | 15 | 25 | 29 | 9 | 2 | 4 | 107 |

Percent correct exact CDC category = 41/107 = 38% (48% in 2015)
 Percent correct within one CDC category = 83/107 = 78% (84% in 2014)

Table 11. Forecast vs. Observed CDCs, 2016.

The breakdown of CDC values for each of the past 21 seasons is shown in Table 12. This year had 15 days on which large (walnut or larger) hail fell; the average is 12. There were 14 large-hail days in 2015. There were 69 thunderstorm days in 2016, (84 in 2015), while 65 is average. Golf ball or larger hail fell on 6 days in 2016; the average is 7 days.

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Summary of 2016 Observed Convective Day Categories (CDCs)

| | DAYS WITH NO SEEDING | | | Thunder But No Hail | DAYS WITH HAIL (maximum hail size) | | | | | Totals |
|----------------|--------------------------|-------------------------|-------------------------|---------------------------|------------------------------------|-------------------------|-------------------------|-------------------------|-------------------------|--------|
| | Mostly Clear Skies | Clouds, Virga | Showers | | Pea | Grape | Walnut | Golf Ball | >Golf Ball | |
| <i>Season</i> | <i>CDC</i> -3 | <i>CDC</i> -2 | <i>CDC</i> -1 | <i>CDC</i> 0 | <i>CDC</i> +1 | <i>CDC</i> +2 | <i>CDC</i> +3 | <i>CDC</i> +4 | <i>CDC</i> +5 | |
| 1996 | 27 | 21 | 12 | 11 | 5 | 12 | 3 | 1 | 1 | 93 |
| 1997 | 7 | 19 | 6 | 28 | 19 | 11 | 3 | 0 | 0 | 93 |
| 1998 | 14 | 24 | 2 | 29 | 23 | 8 | 2 | 4 | 1 | 107 |
| 1999 | 21 | 18 | 8 | 24 | 22 | 10 | 2 | 1 | 1 | 107 |
| 2000 | 13 | 21 | 8 | 26 | 18 | 9 | 2 | 9 | 1 | 107 |
| 2001 | 20 | 4 | 19 | 18 | 19 | 18 | 5 | 4 | 0 | 107 |
| 2002 | 27 | 8 | 20 | 16 | 15 | 17 | 3 | 1 | 0 | 107 |
| 2003 | 24 | 7 | 20 | 28 | 8 | 12 | 2 | 5 | 1 | 107 |
| 2004 | 11 | 4 | 28 | 29 | 15 | 11 | 3 | 5 | 1 | 107 |
| 2005 | 13 | 13 | 22 | 28 | 17 | 9 | 1 | 2 | 2 | 107 |
| 2006 | 19 | 14 | 15 | 24 | 19 | 5 | 6 | 3 | 2 | 107 |
| 2007 | 15 | 17 | 15 | 26 | 17 | 8 | 5 | 2 | 2 | 107 |
| 2008 | 15 | 7 | 10 | 34 | 17 | 15 | 2 | 6 | 1 | 107 |
| 2009 | 22 | 11 | 10 | 41 | 15 | 2 | 3 | 2 | 1 | 107 |
| 2010 | 3 | 10 | 9 | 37 | 11 | 27 | 8 | 1 | 1 | 107 |
| 2011 | 15 | 5 | 14 | 8 | 7 | 22 | 20 | 15 | 1 | 107 |
| 2012 | 8 | 7 | 22 | 14 | 4 | 16 | 12 | 22 | 2 | 107 |
| 2013 | 17 | 7 | 6 | 12 | 9 | 34 | 10 | 10 | 2 | 107 |
| 2014 | 11 | 9 | 22 | 7 | 11 | 19 | 6 | 18 | 4 | 107 |
| 2015 | 8 | 11 | 24 | 18 | 16 | 16 | 6 | 6 | 2 | 107 |
| 2016 | 8 | 6 | 9 | 15 | 25 | 29 | 9 | 2 | 4 | 107 |
| <i>Totals</i> | 318 | 243 | 301 | 473 | 312 | 310 | 113 | 119 | 30 | 2219 |
| <i>Average</i> | 15 | 12 | 14 | 23 | 15 | 15 | 5 | 6 | 1 | |
| <i>Maximum</i> | 27 | 24 | 28 | 41 | 25 | 34 | 20 | 22 | 4 | |
| <i>Minimum</i> | 3 | 4 | 2 | 7 | 4 | 2 | 1 | 0 | 0 | |

Table 12. Seasonal Summary for 2016 of Observed Convective Day Categories (CDCs).

For Table 12 and the other tabulations in this report, the “observed CDC” is taken to be the greater of the hail sizes reported by Environment Canada, and the Agricultural Financial Services in Lacombe, or the hail sizes estimated from the vertically-integrated liquid (VIL) measured by the project radar.

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11.8 THE HAILCAST MODEL

The Hailcast model (Brimelow, 1999, Brimelow *et al.*, 2006) was again used this summer to objectively forecast the maximum hail size over the project area. Hailcast consists of two components, namely a steady-state one-dimensional cloud model and a one-dimensional, time dependent hail model with detailed microphysics. The reader is referred to Brimelow (1999) for a detailed explanation of the model. Forecast soundings for Red Deer and Calgary were downloaded daily from the Plymouth State or Storm Machine website. A decision tree scheme was used to determine whether or not the soundings should be used to initialize the model. The decision tree is based on the work of Mills and Colquhoun (1998). The Hailcast model was not run if the atmospheric profile showed significant inhibition at 700 mb (approximately 10,000 feet) or warming greater than 1°C aloft during the day.

The performance of the HAILCAST model in 2016 was less helpful than usual, the HSS being only +0.23, down from +0.43 in 2015. [Recall that HSS values greater than +0.40 are considered skilled.] The probability of detection (POD) of hail events was 0.91, with a false alarm ratio (FAR) of 0.20.

The Critical Success Index (CSI) for Hailcast was +0.74, only slightly better than the +0.70 for the WMI forecasters. These results demonstrate that while Hailcast is a useful tool it has weaknesses similar to many models and the results need to be interpreted within the context of the overall meteorological situation, taking into consideration other synoptic, mesoscale, and dynamic aspects that are not included in the one-dimensional model. One must also keep in mind that the input to Hailcast was routinely the 12-hour prognostic soundings of the WRF model. It is important to look at the full 24 hours of forecast soundings to use as input for Hailcast. Further research into the refinement of the Hailcast decision tree remains warranted, and of course, due care must be taken to input the proper sounding.

12. COMMUNICATIONS

Reliable communications for all project personnel and managers is essential for smooth and effective operations. These communications take place on a number of levels, with mixed urgencies. Real-time information-sharing and operational decision-making require immediate receipt of messages so appropriate actions can be taken. Time is of the essence. Routine daily activities such as completion of project paperwork and reports manifest less urgency, but still require due short-term attention. There are also project matters of importance on a weekly (or longer) time frame; these can be handled still more casually.

In the current age of widespread cellular telephone usage and coverage, mobile telephones have proven to be the most dependable means for project communications. Other real-time, project-essential communications occur between the Operations Centre and project aircraft; these are accomplished by voice radio transmissions. Aircraft positions and seeding actions are communicated to the Operations Centre via data radio.

For intra-project communications, all project personnel have cellular telephones. Pilots, who were on-call and had flexible hours, always carried their mobile phones, and kept them well-charged and turned on. Meteorological staff did likewise, but because of their more structured hours and location (primarily the Operations Centre) was often reliably contactable via land (telephone) lines, especially while at the operations centre.

12.1 INTERNET ACCESS

High-speed internet access offices for the flight crews based in Springbank and Red Deer was established at the airports. Such access ensured real-time awareness of storm evolution and motion prior to launches, and gave the pilots better knowledge of the storm situations they would encounter once launched.

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12.2 USE OF E-MAIL AND TEXT MESSAGES

E-mail and text messaging were discouraged when immediate receipt of information was essential, because the sender would not know with certainty if/when the recipient had received or would receive the message. Both were acceptable for non-urgent situations; however in that context e-mail was preferred whenever any record of the message content and/or timeliness is needed. The on-site program manager routinely sent blanket text message notifications of aircraft launches to all project field personnel, so everybody knew when operations commenced, and which aircraft was (were) flying.

13. CASE STUDY

A detailed review and summary of the largest event of the 2016 season is provided below. The recapitulation reveals the sequence of events in dealing with the storm: when various aircraft were dispatched to respond to the developing threats, how the storms evolved and where they moved, when seeding began and ended, and how (in a general sense) the storms responded to treatment.

13.1 WEATHER SYNOPSIS AND FORECAST FOR 30 JULY 2016

On the morning of July 30th the project forecaster issued a Convective Day Category (CDC) of +3, indicating significant risk of multicellular storms with damaging hail up to the size of walnuts. Convection was forecast to initiate along the foothills in the afternoon and persist through at least sunset. Storms were forecast to be severe and fast moving. The model sounding for the afternoon showed CAPE (convectively-available potential energy) of 1,100 J/Kg, and a moderately unstable Lifted Index of -4°C (Figure 38). A moderate capping inversion was forecast to hold through midafternoon, but it would begin eroding by midday.

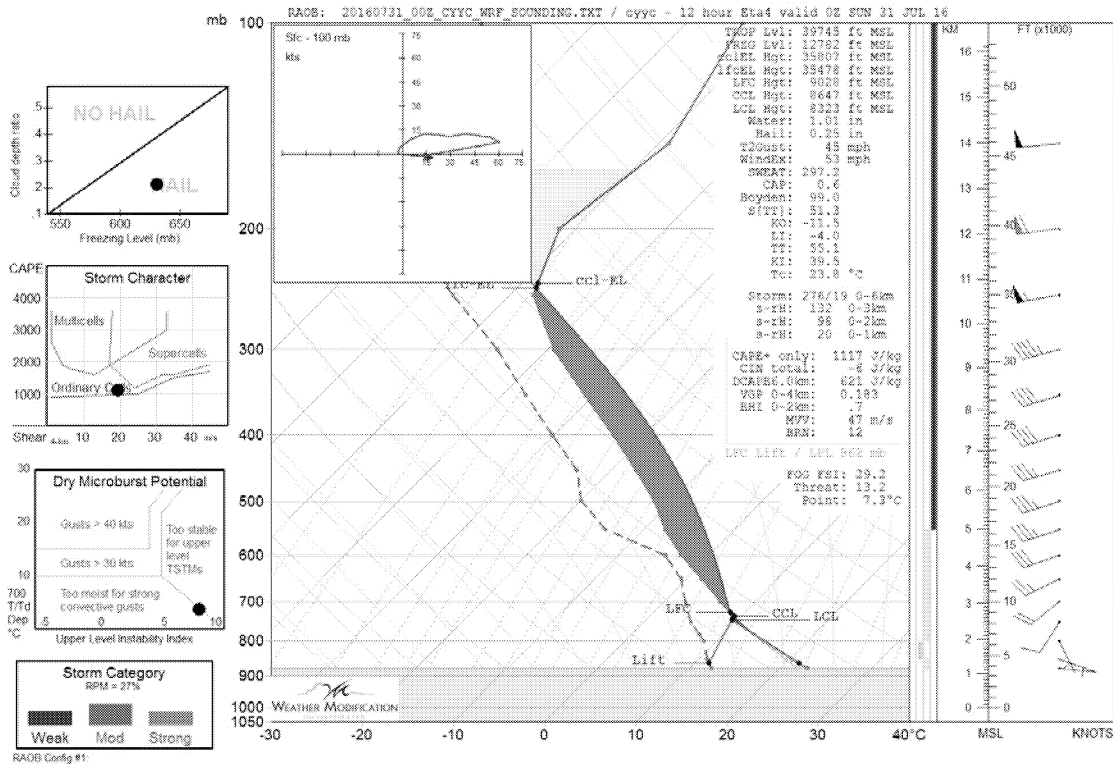


Figure 38. The atmospheric vertical profiles of temperature, moisture, and winds, as predicted for 6 pm local time on 30 July 2016.

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A cold front would be pushing southeastward through the project area during the day, another trigger mechanism for storms (Figure 39).

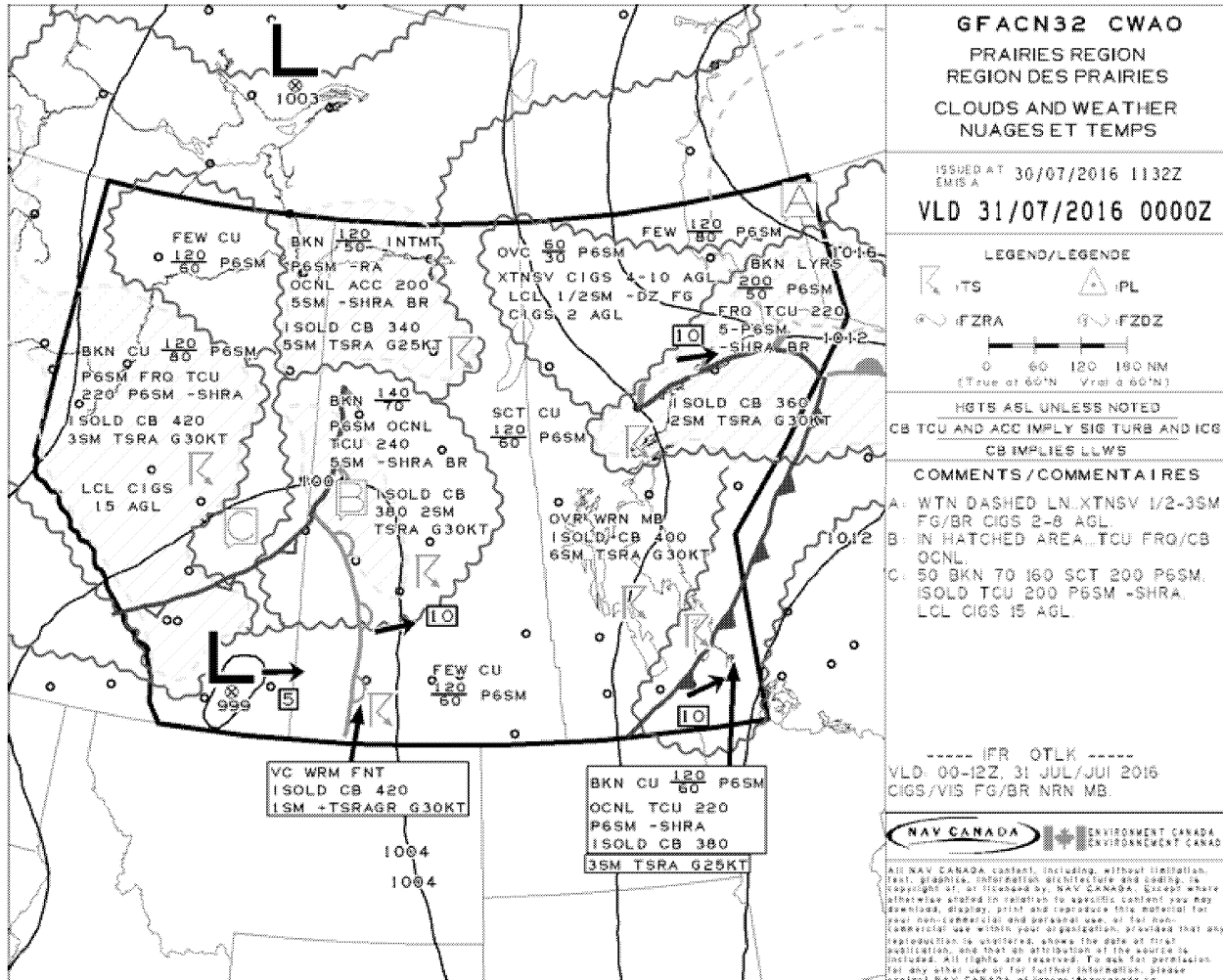


Figure 39. The surface analysis for 6 pm MDT on 30 July 2016 showed low pressure over Southern Alberta and a cold front pushing through the area creating a strong trigger for afternoon convection.

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In addition, upslope flow (lifting by terrain) would be created by southeast surface winds. A surface low was over southeastern Alberta, helping to draw moisture into the region and further enhance instability over the southern project region. Low level charts showed a large plume of warm moist air, evident by the Theta E ridge at 850 mb (Figure 40).

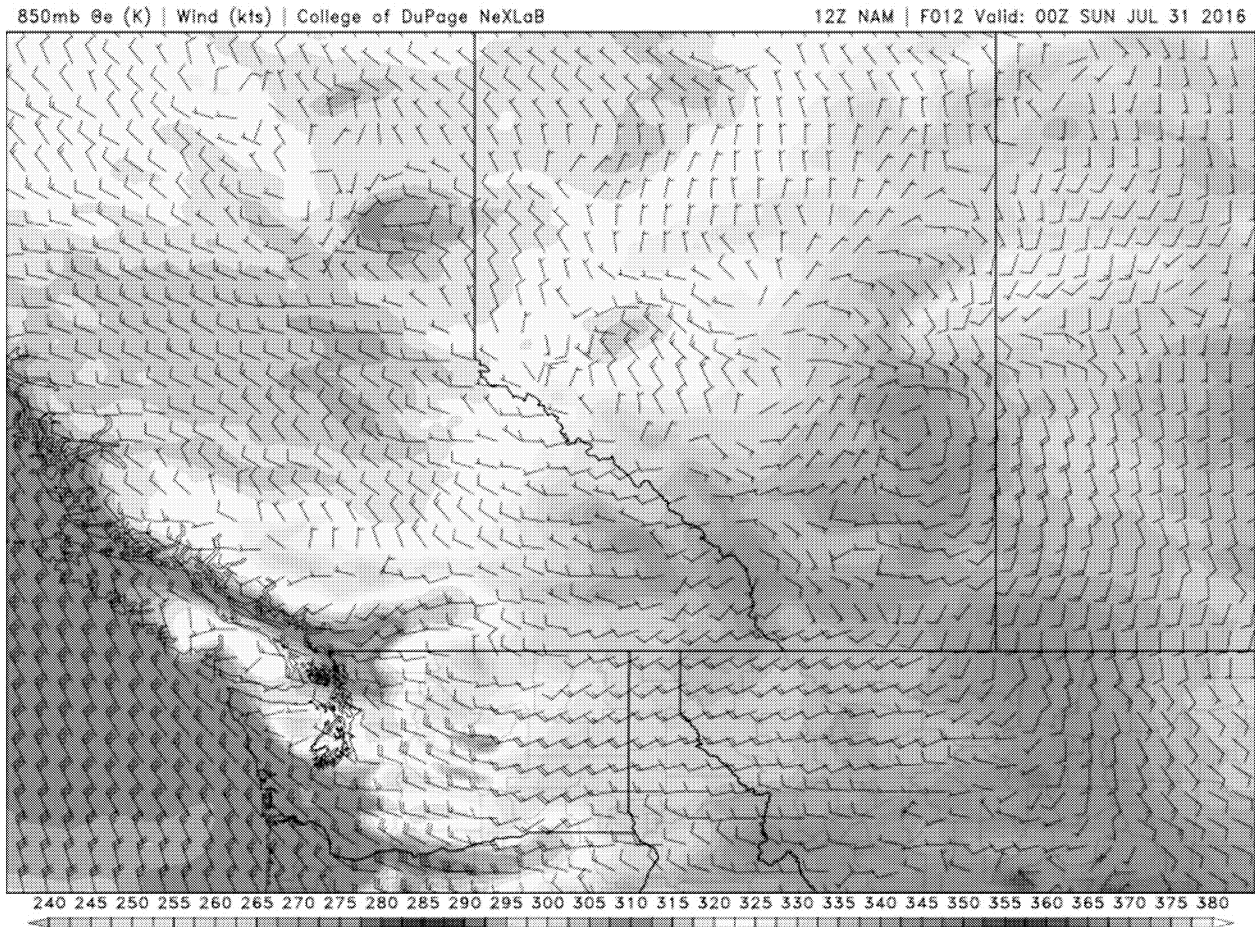


Figure 40. Low level (850 mb) equivalent potential temperature (Theta E) chart for 6 pm MDT on 30 July 2016 indicated warm moist air was flowing into the region from the southeast and also the northeast due to the low near the Saskatchewan border. Converging winds are evident over the southern project region.

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A large midlevel trough was approaching from the west. However, midlevel vorticity advection was not expected to be strong in the afternoon hours (Figure 41).

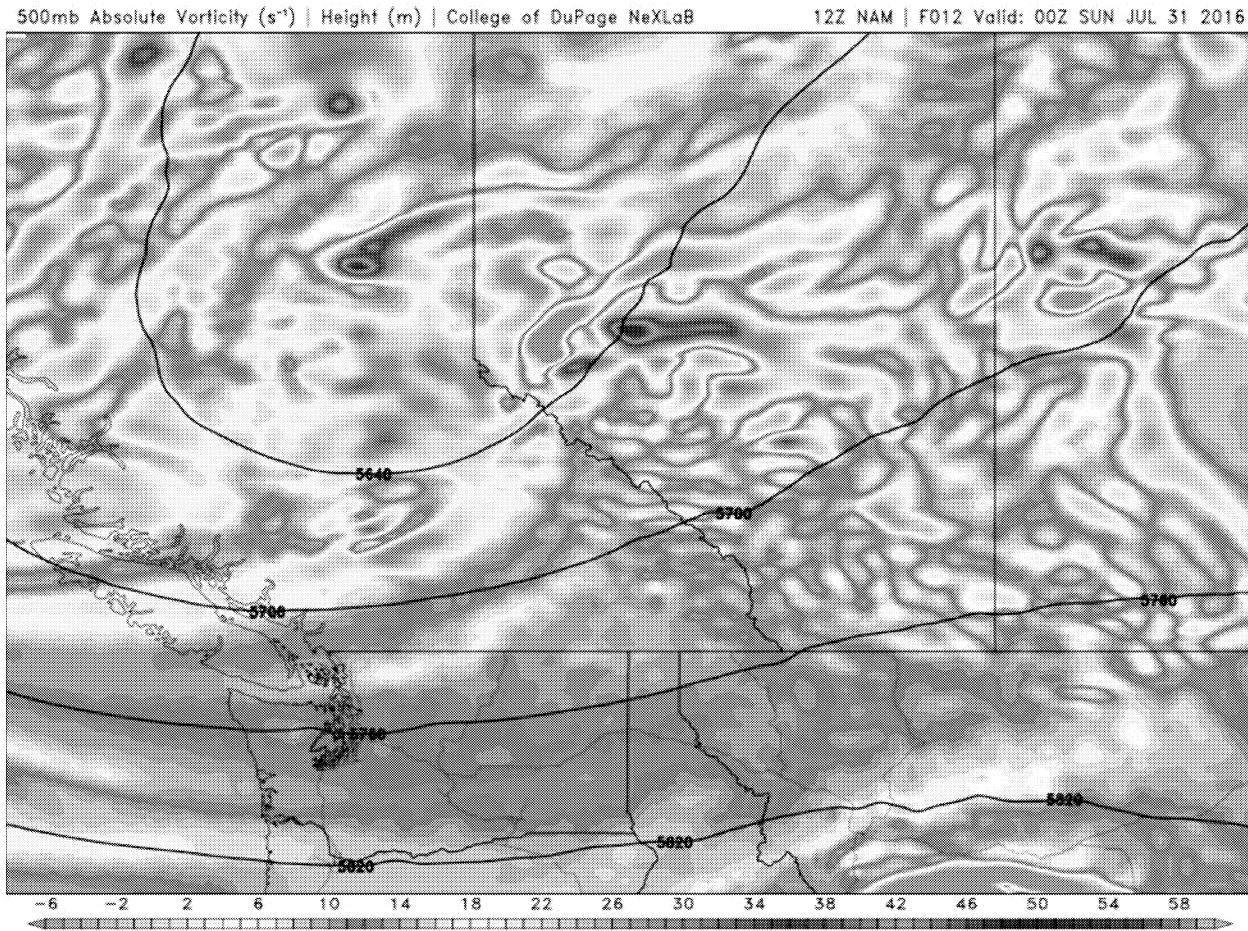


Figure 41. The mid-level (500 mb) heights and vorticity at 6 pm MDT on 30 July 2016 showed southwesterly wind flow, but no large lobes of vorticity moving through the region.

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Upper jet-level charts indicated an upper low over British Columbia. A 65 knot jet streak would be rounding the base of the low in BC and pushing into AB during the afternoon (Figures 42, 43). The strong upper level winds aided in creating strong bulk speed shear values in the vertical wind profile, supportive of strong organized updrafts and large hailstone development. The Hailcast model indicated large hailstones were likely as well, up to 3.9 cm over Calgary and 2.4 cm in the Red Deer area. The highest risk for large damaging hail was in the southern project region.

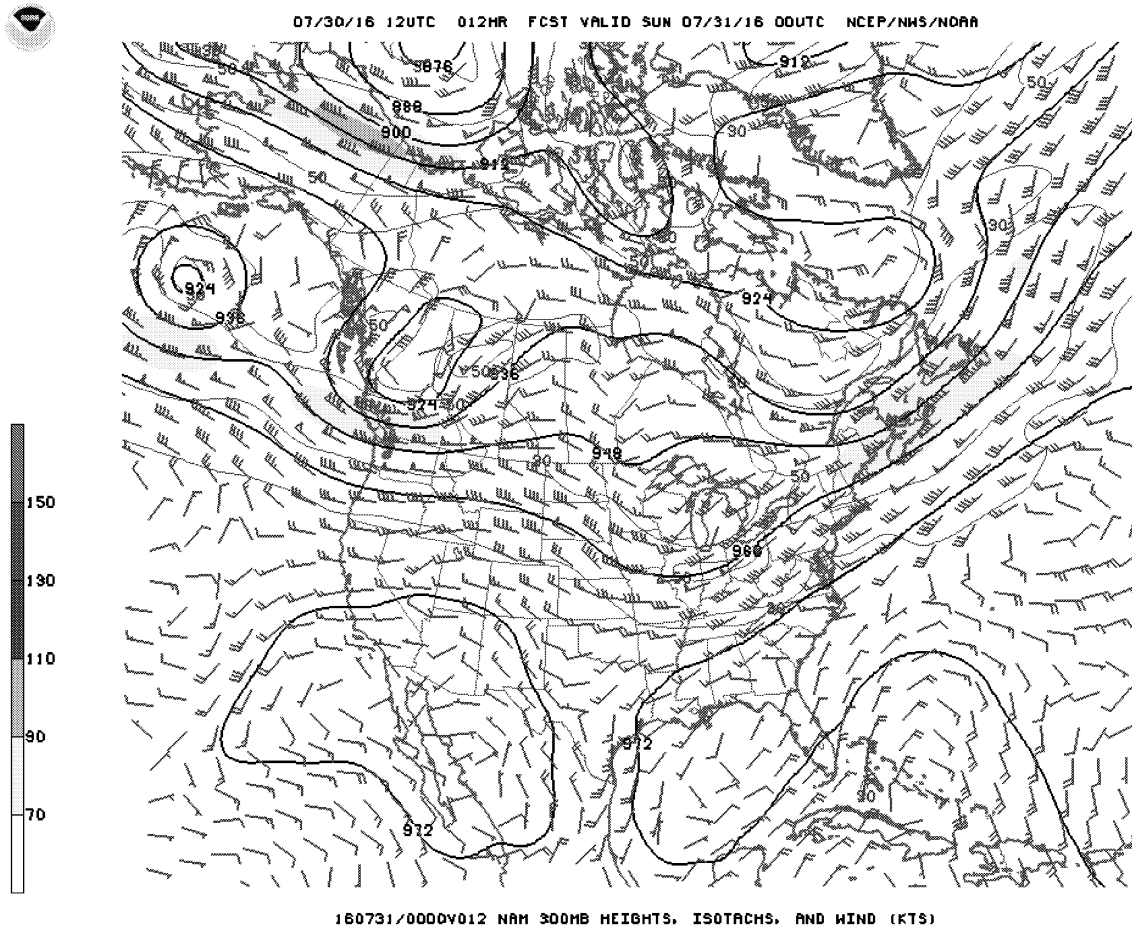


Figure 42. Jet stream- level (300 mb) Winds and Heights for 6 pm MDT for 30 July 2016 indicated an upper low over British Columbia, a 65 knot jet streak approaching southern Alberta, along with diffluent winds aloft near the protected area.

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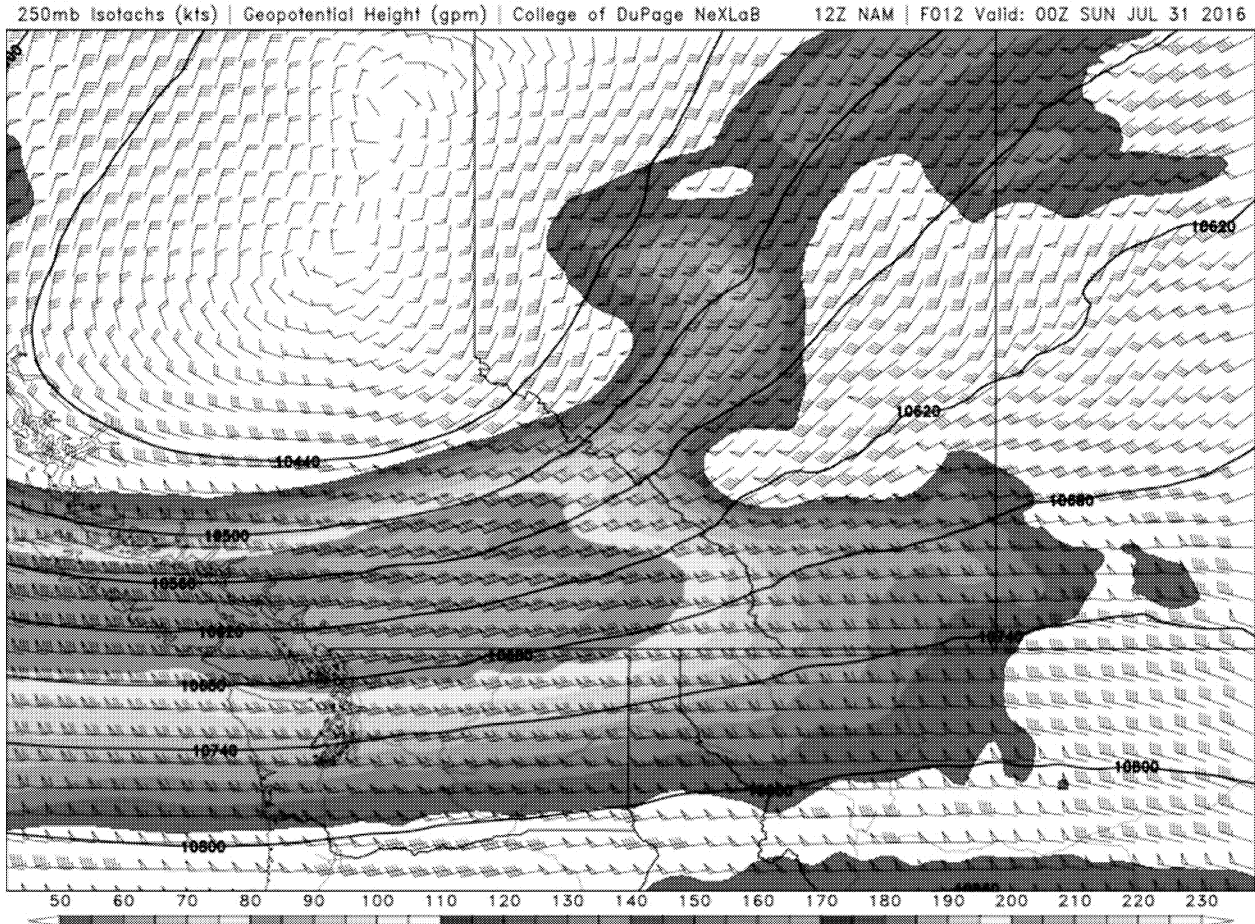


Figure 43. The detailed 250 mb level jet stream winds at 6 pm MDT on 30 July 2016 showed 60+ knot winds over Southern Alberta, enhancing the wind shear in the vertical wind profile. The left front quadrant of the upper jet was also pushing into the project area, which is known to enhance deep convection through synoptic scale ascent (lifting).

OPERATIONS SUMMARY

The first convection of the day initiated along the foothills in the late morning hours. The first flight of the day was launched from Springbank at 11:52 MDT. Hailstop 1 patrolled the foothills west of Calgary for about a half hour before returning to Springbank at 12:45 MDT. This first wave of convection to move off the foothills was not a significant hail threat.

The next flight of the day was launched from Red Deer at 14:18 MDT toward a developing line approaching Rocky Mountain House. Hailstop 4 reached Rocky Mountain House at 14:50 MDT, but the cells were not a hail threat. A much stronger cell was developing west of Cremona, so Hailstop 4 repositioned to this cell. Base seeding of storm #1 west of Cremona began by Hailstop 4 at 15:15 MDT, and was soon joined by Hailstop 5 at cloud top and Hailstop 2, at cloud base with Hailstop 4. This storm was seeded continuously until it reached Airdrie. With a new line of convection developing upwind (west) of Springbank, Hailstop 1 was launched to make sure it would not be trapped on the ground under the storm, as that aircraft would soon be needed as well. At 16:16 MDT, yet another new cell was developing near Cochrane, moving toward Calgary, and the three seeding aircraft (Hailstop 2, 4, and 5) were shifted southwest from the Airdrie cell to the Cochrane area, for what was to be considered storm #3 of the day. Hailstop 1 continued to hold over the Olds area until it would be needed to replace Hailstop

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5. At 16:17 MDT, Hailstop 3 was also launched to some developing convection west of Lacombe. However, upon reaching the cells, they had not become as significant a threat as the storms in the south. Therefore, after some brief seeding on storm #2 near Ponoka, Hailstop 3 was diverted to the Strathmore area to be ready for the storm approaching Calgary as well (along with Hailstop 1).

At 16:48 MDT or 22:48 UTC (Figure 44) all five Hailstop aircraft were now airborne. HS2, HS4, and HS5 had been seeding storm #3 near Cochrane for half an hour after finishing with the Airdrie cell.

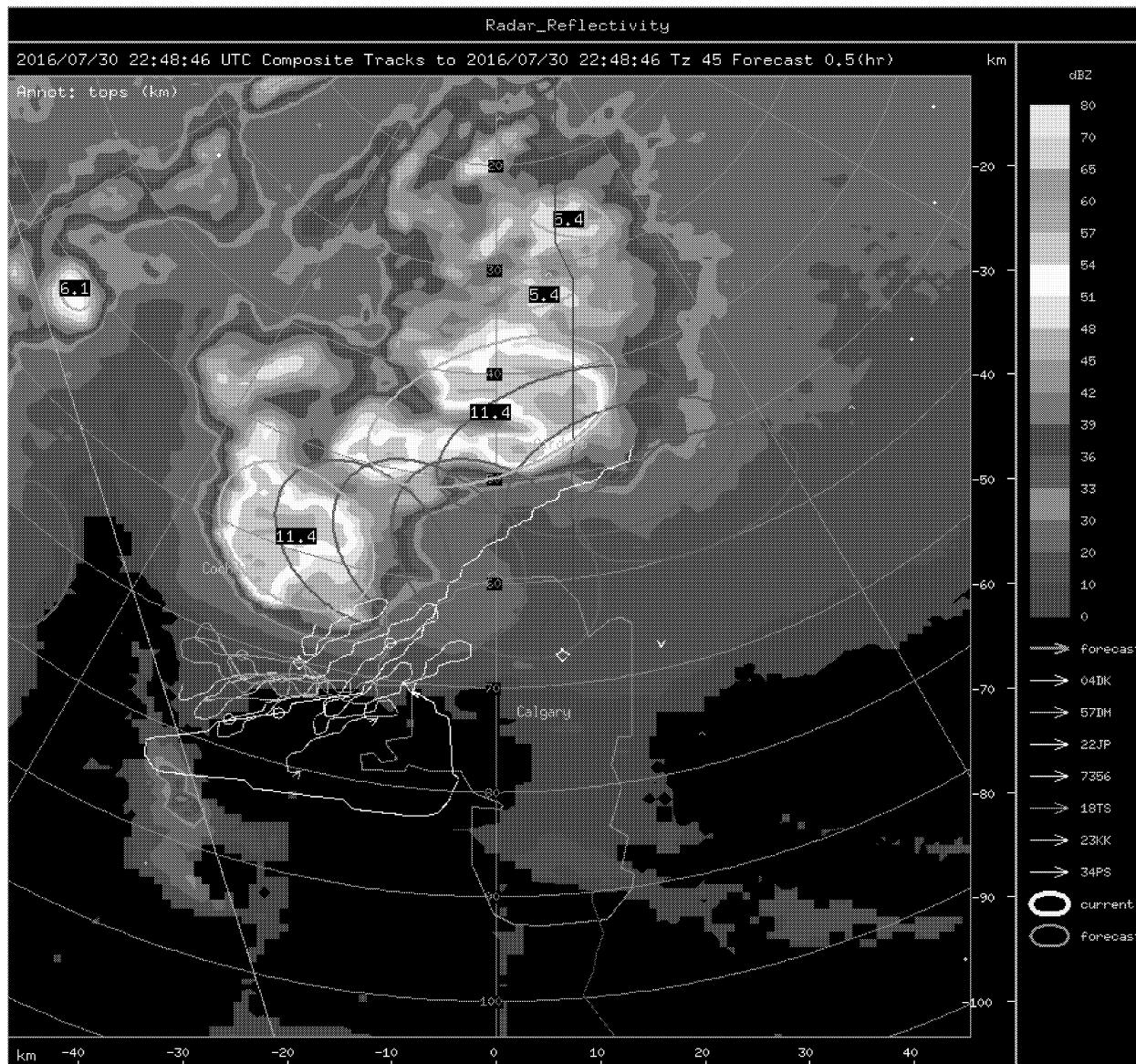


Figure 44. The Olds-Didsbury radar display at 22:48Z (16:48 MDT) showing the most damaging cell of the day approaching northern Calgary. The cell was seeded continuously with two base seeders and one top seeder. At this time, Hailstop 5 (pink) is exiting the area as they are replaced at cloud top by Hailstop 1 (white). This cell would ultimately drop greater than golf ball size hail over a portion of northeast Calgary.

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Hailstop 5 depleted their seeding flares at 23:01 UTC (17:01 MDT) and was replaced by Hailstop 1 at cloud top at that time. Hailstop 5 returned to Springbank, now clear of storms, to reload and refuel. As storm #3 moved through the northern edge of Calgary, it was seeded by three aircraft (figures 45, 46). This was the most damaging cell of the day. Due to the proximity to Calgary International Airport, the base seeding aircraft were limited by air traffic control (ATC) as to how close they could get to the storm over the northeast part of the city. While this presented a challenge to operations, pilots were able to maintain inflow and continue seeding over southwest Calgary.

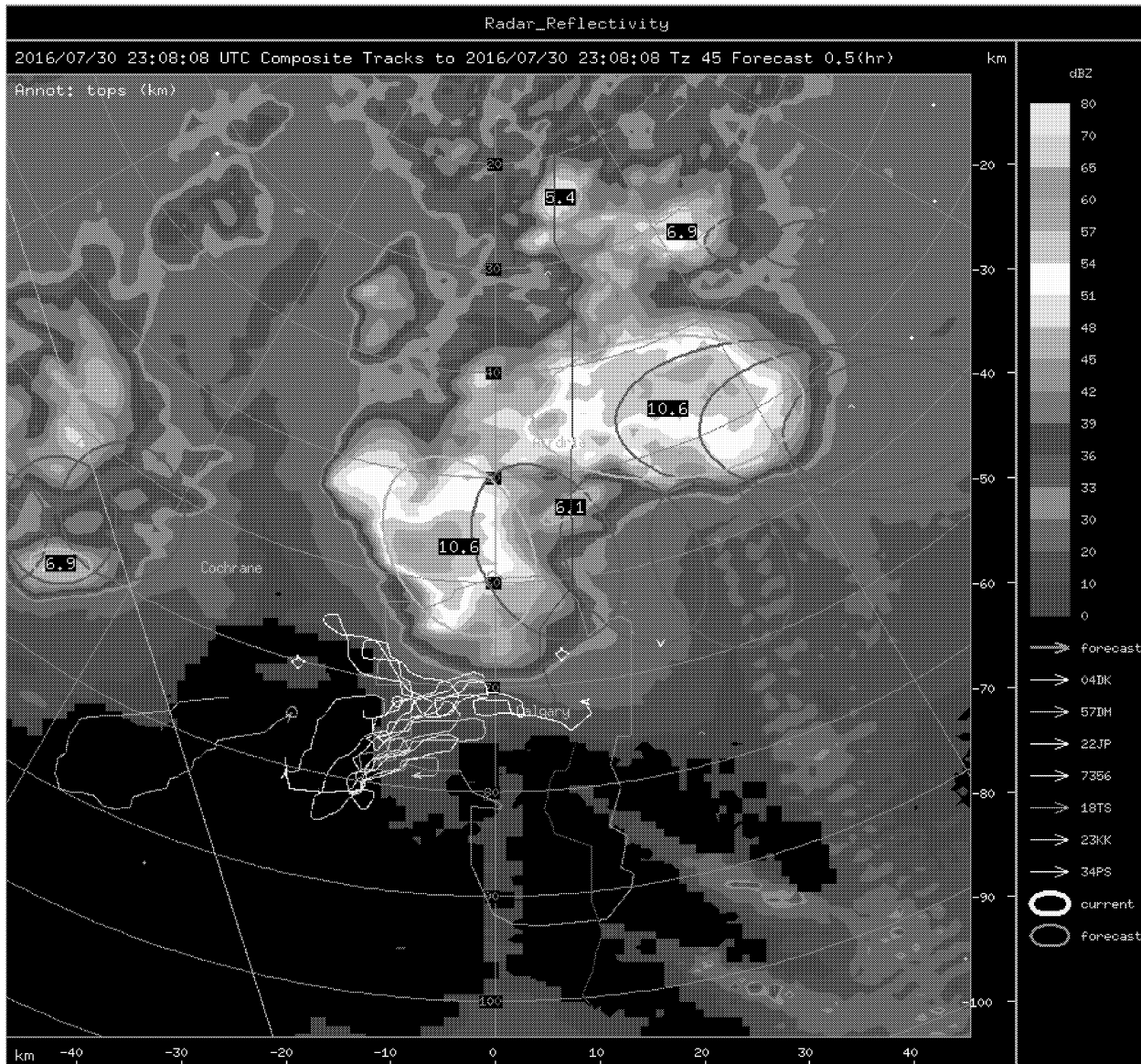


Figure 45. The Olds-Didsbury radar display at 23:08Z (17:08 MDT) showing the most damaging cell of the day, storm #3, approaching northern Calgary. As the cell approached the Calgary International Airport, the base seeding aircraft remained near the Nose Hill area to avoid ATC conflicts. A new cell was then forming over northwest Calgary near the base seeding flight tracks which was not showing on the project radar yet. Base seeders reported very intense inflow over NW Calgary at this time.

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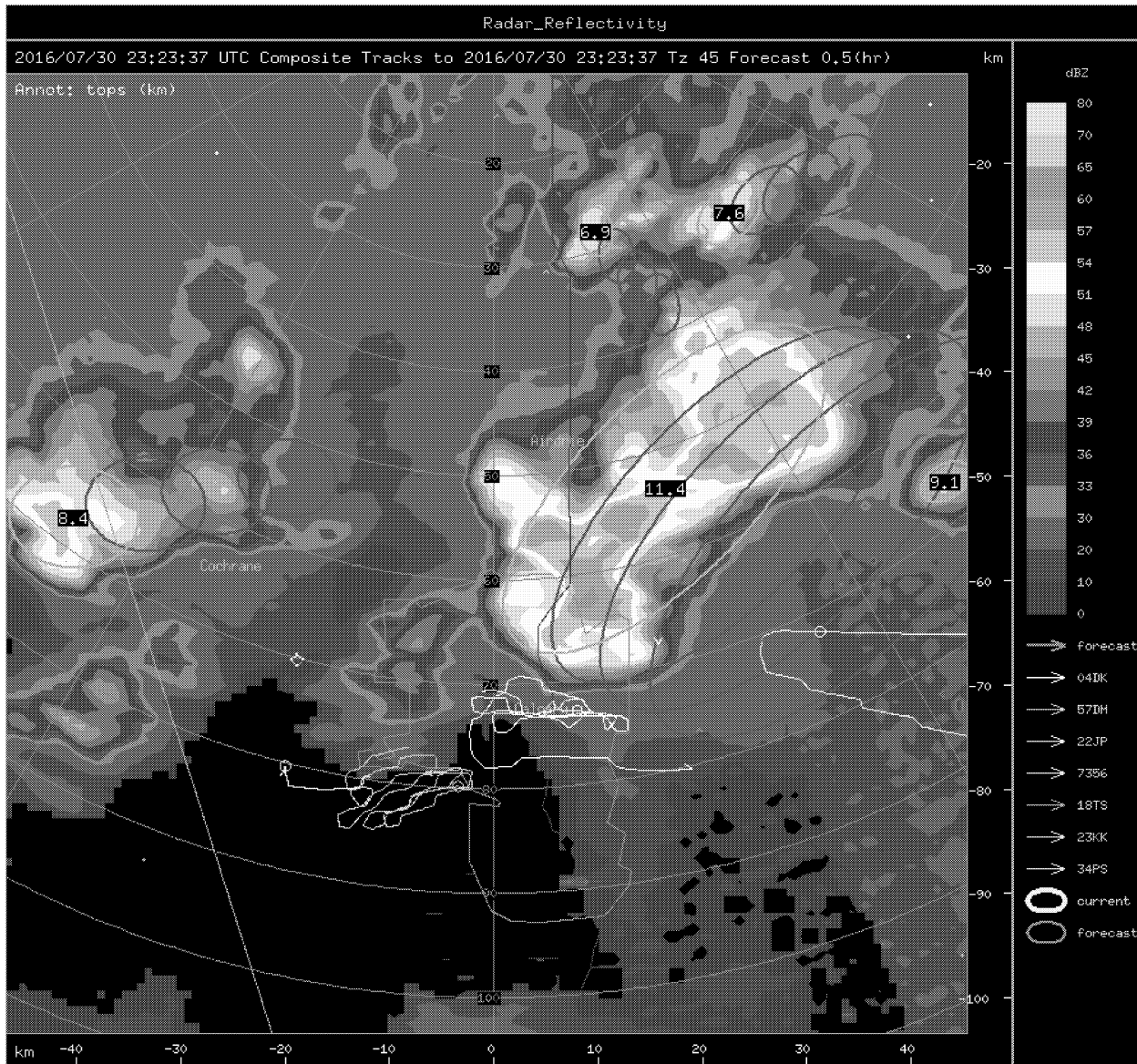


Figure 46. The Olds-Didsbury radar display at 23:23Z (17:23 MDT) showing storm #3 exiting northeast Calgary as a new convective cell began to show up on radar near Nose Hill. This new cell would develop into an intense echo and move through downtown. At this time, Hailstop 4 (green) had depleted their seeding chemical and was just starting to head back to Springbank to reload and refuel. Hailstop 2 (orange) was soon to follow.

As storm #3 was about to exit northeast Calgary, another cell began developing over the Nose Hill area over northwest Calgary (Figure 46). This cell was rapidly intensifying with extreme inflow reported, and all resources were diverted to this new cell which would move through Downtown. This new growth was connected to the severe cell over northwest Calgary. At 17:14 MDT, Hailstop 4 was out of chemical and landed in Springbank to reload and refuel. At 17:32 MDT, Hailstop 2 was nearly out of chemical and landed in Springbank between a break in the line to reload and refuel. With three planes on the ground reloading, this left Hailstop 1 and Hailstop 3 to defend against the cell exiting Downtown Calgary and a newly developing cell (storm #4) approaching southwestern Calgary from the Bragg Creek area. Once the cell over Downtown exited the city, both planes (Hailstops 1 and 3) converged over the southwest cell, storm #4.

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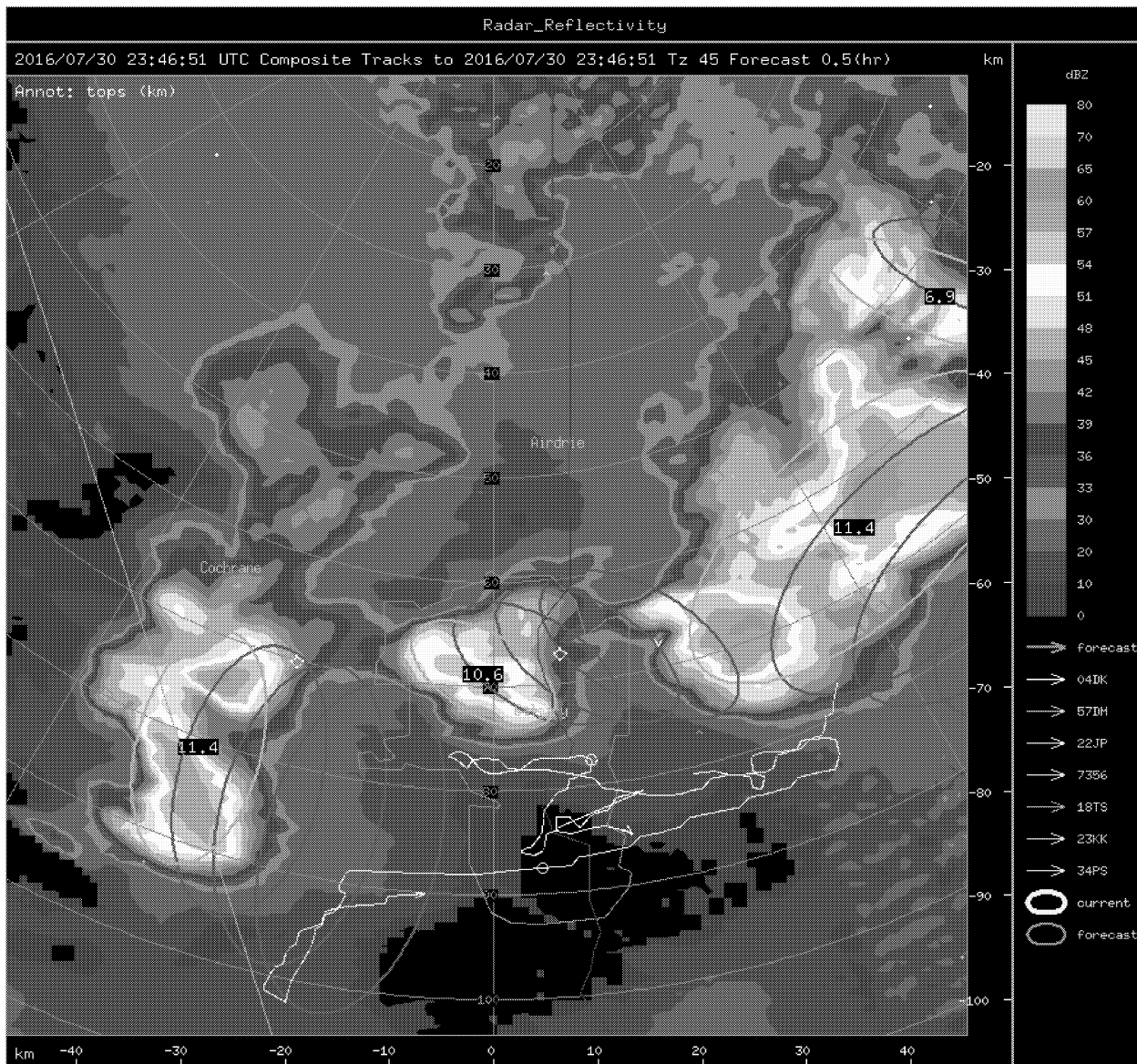


Figure 47. The Olds-Didsbury radar display at 23:46Z (17:46 MDT) showing the new growth near Nose Hill maturing into a severe 10.6 km cell over Downtown Calgary while another severe cell forms near Bragg Creek. Once the cell near downtown exited the city, both remaining planes converged on the cell near Bragg Creek which would ultimately pass through southern Calgary.

Hailstop 1 descended to cloud base while Hailstop 3 top-seeded as the cell moved through southern Calgary around 18:00 MDT. Top seeders also ran into issues with ATC restrictions for a brief time as there was a declared emergency from a commercial airliner which took heavy hail damage on its approach into Calgary International Airport. This caused a brief interruption in seeding, but the impact on operations only lasted a few minutes. By 18:40 MDT, the last significant hail threat had exited the Calgary area, and all aircraft returned to base to end the day.

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CONCLUSIONS

Large, damaging hail was reported in multiple areas in the southern project area on 30 July 2016. The composite maximum reflectivity plot for the day is shown in Figure 48.

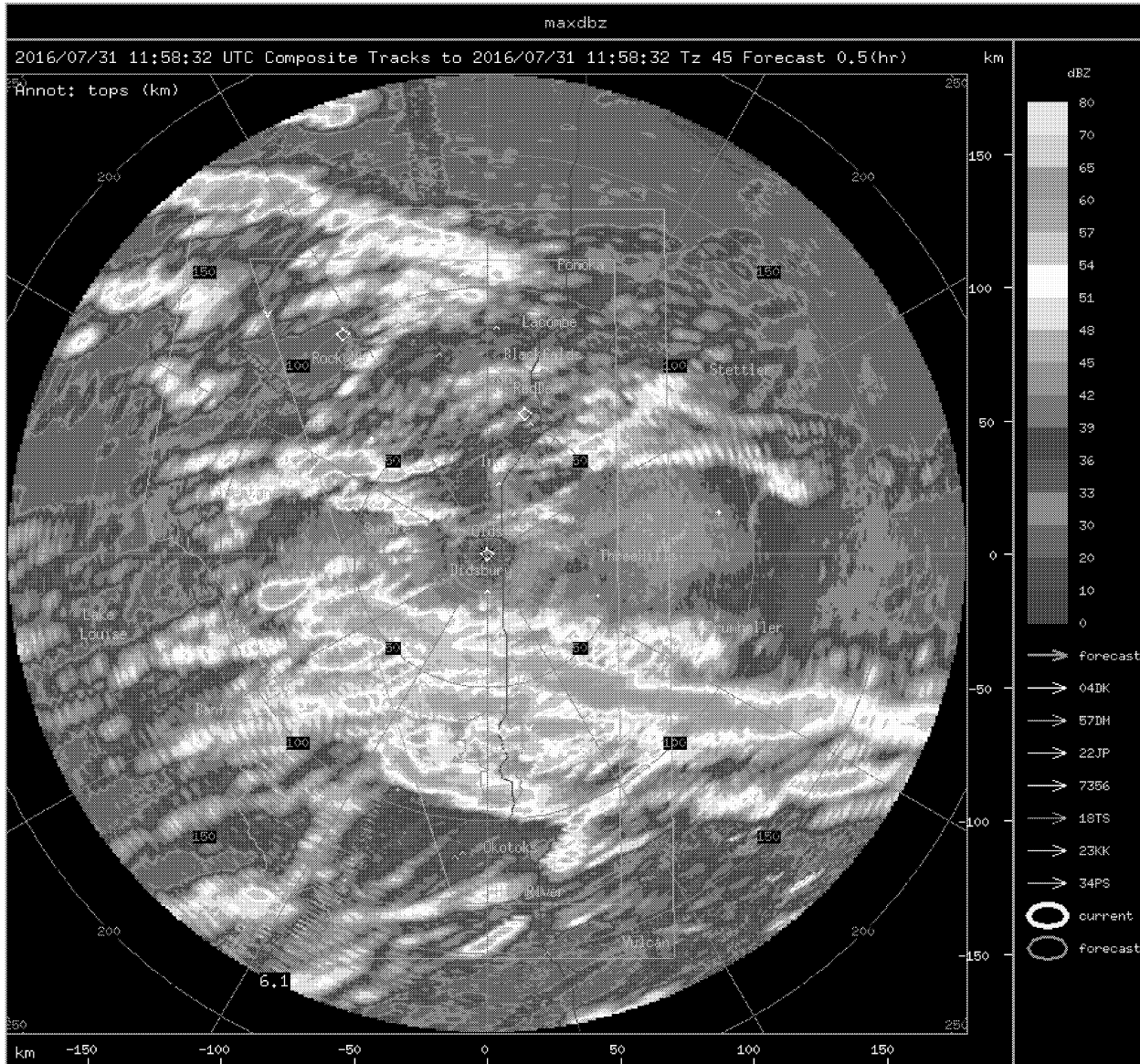


Figure 48. Composite maximum radar reflectivity plot for the entire storm day of 30 July 2016.

Figure 49 shows the composite maximum vertically-integrated liquid (VIL) radar chart for the day. The VIL is known to be well-correlated with hail size, so it is not surprising that the locations of the largest hail reports coincide with those of the greatest VIL.

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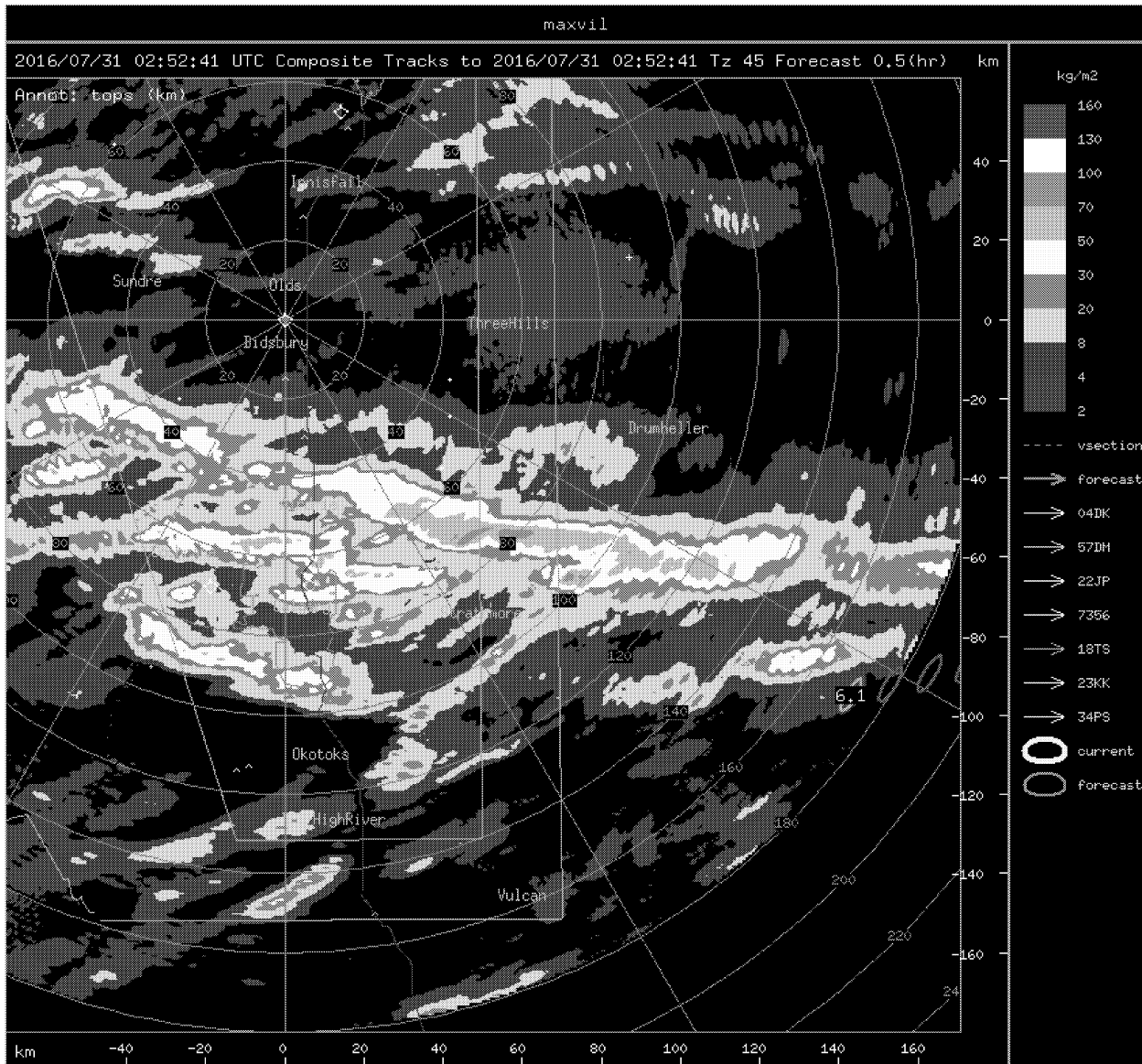


Figure 49. The maximum vertically-integrated liquid (VIL) measured by the radar is shown. The largest hail swaths were associated with the tracks of the northern cell as it tracked downwind of Airdrie after seeding had ended. There are also small pockets of intense VIL (large hail) indicated over northeast Calgary and northwest of the city. There appears to be a significant decrease in VIL (hail size) as the first storm approached Airdrie after seeding began and then much larger values downwind of the city as it moved into the eastern buffer zone without seeding. VIL values over the city of Calgary did not reach nearly the same levels as the unseeded cells north of Strathmore.

The largest hail report was for 5 to 6 cm hail west of Cremona and near Cochrane, outside the cities. Larger-than-golf ball size hail did significant damage to the far northeast part of Calgary, to the tune of several hundred million dollars. Ping pong ball size hail was observed in Airdrie. Toonie size hail was observed in Chestermere, and quarter size hail was reported inside the city of Cochrane. This day posed several operational challenges with multiple waves of fast moving, very intense cells moving through Calgary one after the next. While seeding resources were nearly completely depleted, all storms over the Calgary area were seeded effectively thanks to the availability of the fifth aircraft. Without this fifth plane, the final storm of the day would have likely moved through southern Calgary without effective treatment.

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The other operational challenges were related to Air Traffic Control near the Calgary Airport. Base seeders and top seeders ran into conflicts at times, although crews were able to adjust the seeding strategy appropriately and deal with the challenges to maintain effective treatment of the storms. The only time seeding was temporarily halted at cloud top was during the declared emergency by the commercial airliner, and this was only for a few minutes. The flight tracks of the Hailstop aircraft on 30 July 2016 are shown in Figure 50.

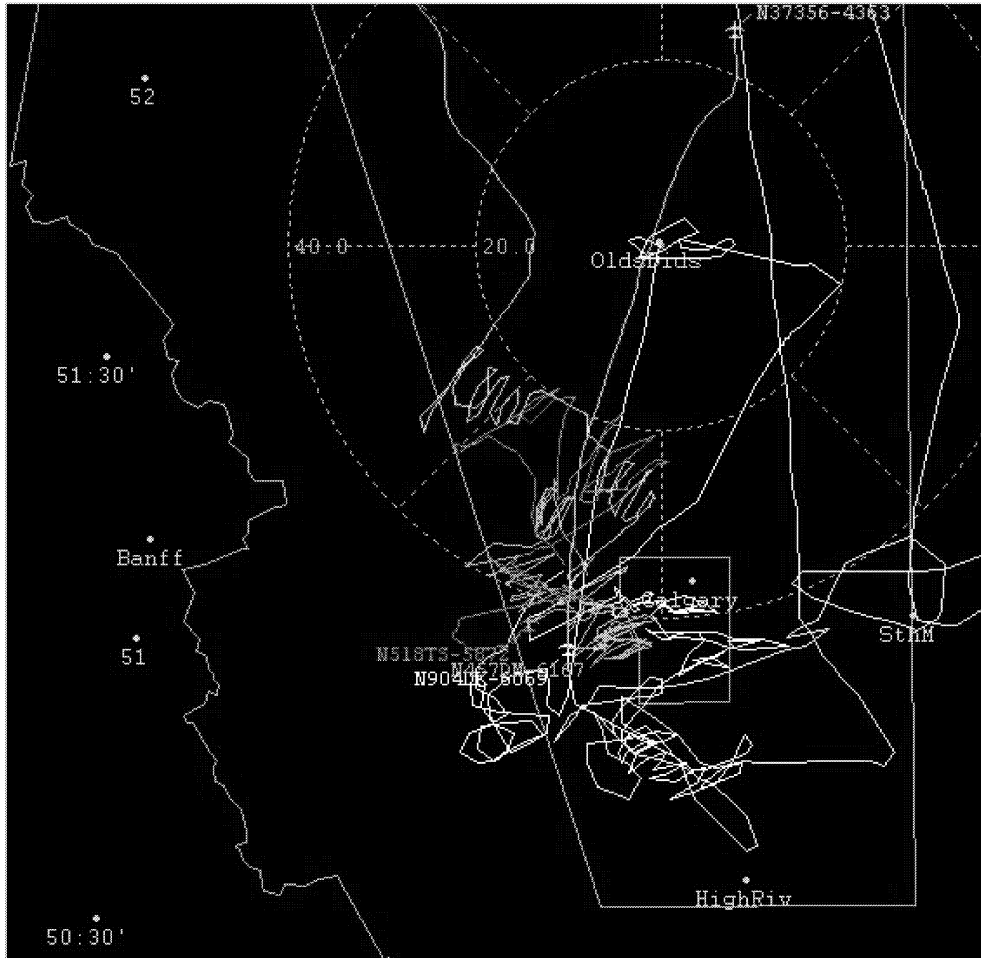


Figure 50. AirLink GPS aircraft seeding tracks for the entire storm day of 30 July 2016. Track colors are as follows: Hailstop 1, white; Hailstop 2, orange; Hailstop 3, light blue; Hailstop 4 green; and Hailstop 5, pink. The WMI AirLink aircraft tracks show that the storms that moved through Airdrie and Calgary were well seeded by multiple aircraft. Seeding began well upwind of the protected cities with sufficient time and dosage for positive seeding affects to be realized.

July 30th was the second most heavily seeded storm day of the 2016 season, second only to June 28th, which saw much slower-moving storms which allow for more seeding. A total of 28 kg of seeding material was released on July 30th. This includes 89 burn-in-place flares, 688 ejectable flares, and 444 minutes of wing tip generator time. All five aircraft flew single but lengthy seeding flights, and Hailstop 1 also had a morning patrol flight as well for a total of six flights for seed and patrol. There were four seeded storms on the day.

GPS flight tracks and analysis of the max VIL maps indicate there were much worse storms in the project area this day which were not seeded. The storms over Calgary which were heavily seeded had much lower VIL values, once again indicating that the storm damage could have been worse.

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14. CLIMATIC PERSPECTIVES

The daily and accumulated rainfall for from 21 January 2016 through 20 January 2017 are shown in Figures 51 and 52, respectively. Calgary was below normal until mid-July, when the convective weather became very active, and remained so through early August. The remainder of the summer was pretty normal, but the wet period pushed the annual total to about 150 mm above normal, where it remained for the remainder of the year.

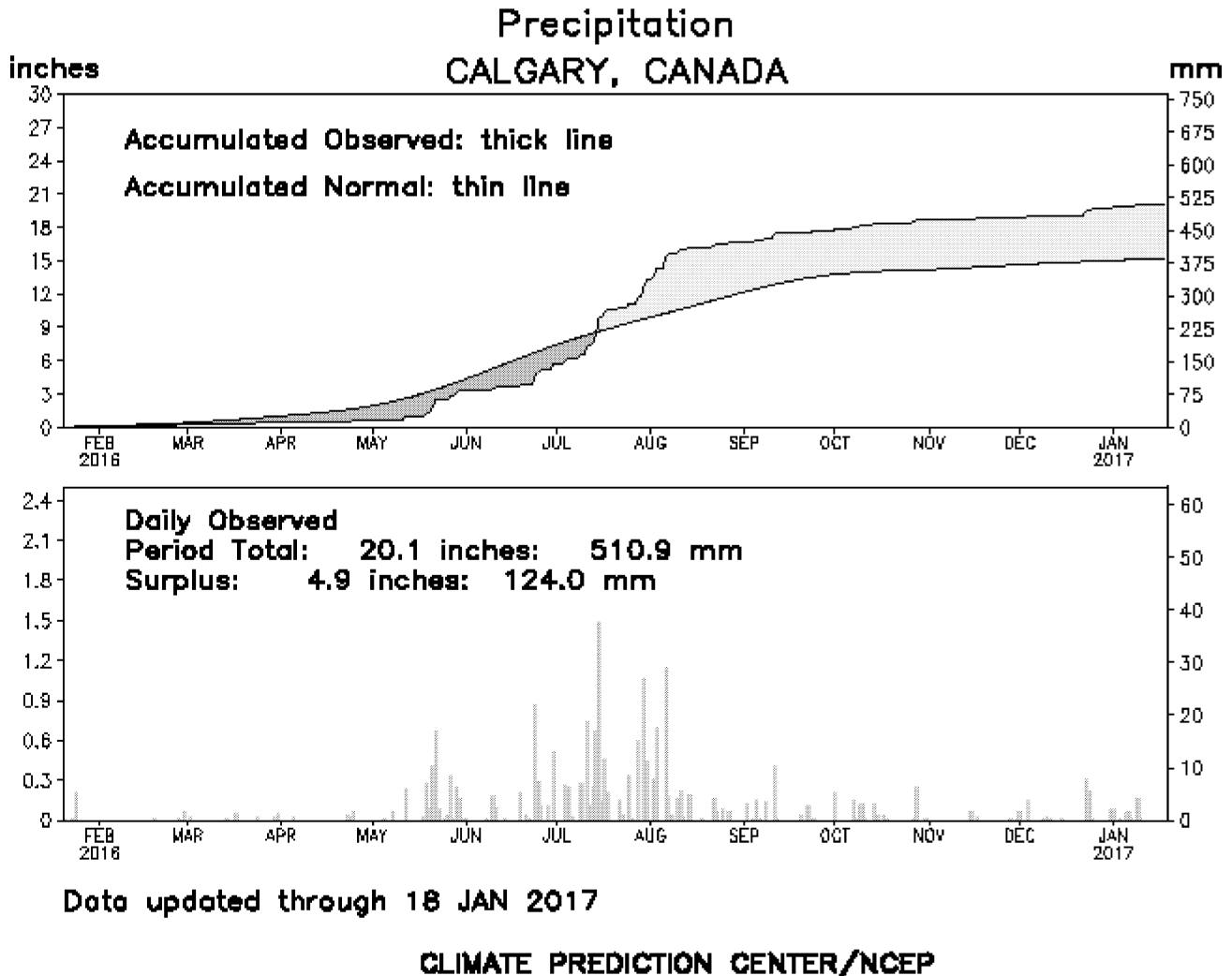


Figure 51. Calgary precipitation, daily and cumulative, for calendar year 2016. (Data and plot from the National Center for Environmental Prediction, NOAA.)

Conditions were drier than normal in Red Deer in early spring 2016. However, May and June were more normal, and like Calgary, July and August, wetter than normal. Precipitation for the rest of the year was close to normal, but 2016 as a whole concluded slightly above normal.

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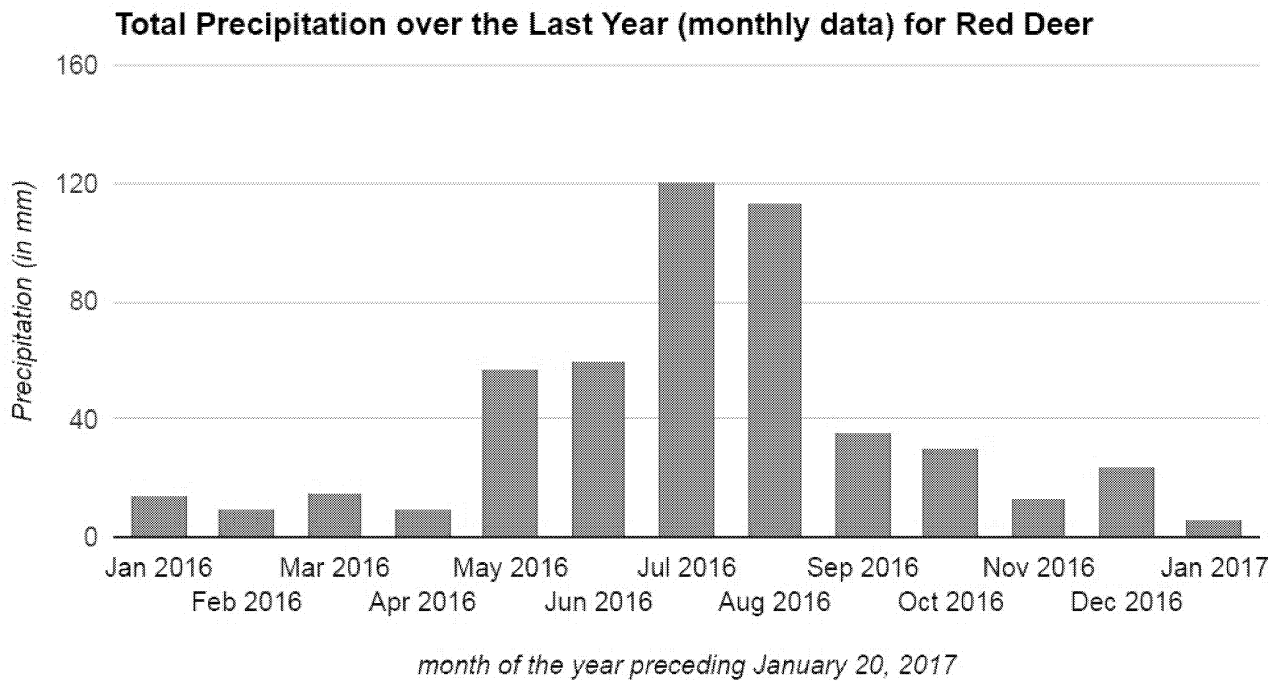


Figure 52. Red Deer 2016 precipitation, by month, from <http://reddeer.weatherstats.ca/metrics/precipitation.html>. An analogous plot for Calgary can be viewed at <http://calgary.weatherstats.ca/metrics/precipitation.html>.

14.1 EL NIÑO/SOUTHERN OSCILLATION (ENSO) DISCUSSION

The links between sea surface temperatures in the equatorial Pacific Ocean and the weather and climate of Alberta are not clearly defined. However, there has been a slightly positive correlation between hot, dry summers and El Niño (warm ocean) conditions; and cool, wet, stormy summers with La Niña (cool ocean) conditions.

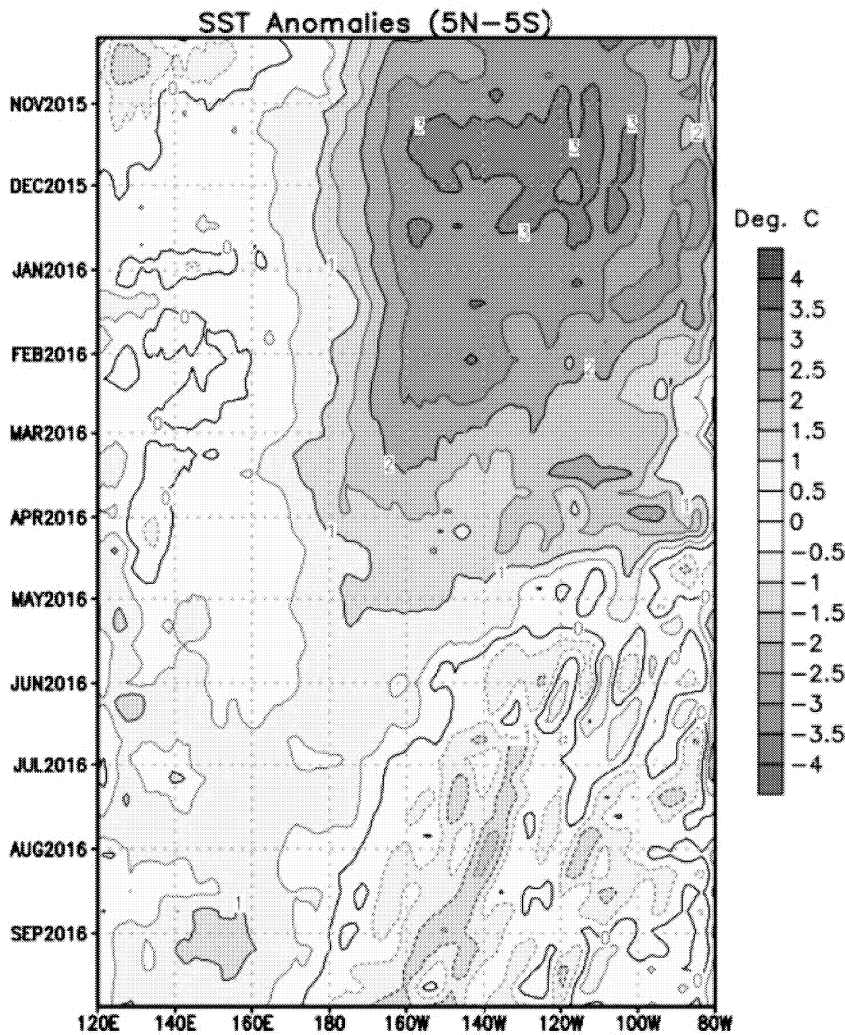
By June, El Niño dissipated and ENSO-neutral conditions returned, as indicated by the expansion of near-to-below average surface temperatures (SST) across the eastern equatorial Pacific Ocean (Figure 53). Below-average subsurface temperatures continued and extended to the surface across the eastern equatorial Pacific. For the first time in 2016, atmospheric anomalies over the tropical Pacific Ocean were also consistent with ENSO-neutral conditions. The traditional and equatorial Southern Oscillation indices were near zero, while the upper and lower-level winds were both near average across most of the tropical Pacific. Collectively, these atmospheric and oceanic anomalies reflect a transition from El Niño to ENSO-neutral conditions.

ENSO-neutral conditions continued through June, as indicated by near-to-below average surface temperatures (SST) across the eastern equatorial Pacific Ocean. While the Niño-4 region was slightly above average, the other Niño indices were either slightly below average or near zero during June. Below-average subsurface temperatures continued and extended to the surface in parts of the central and eastern equatorial Pacific. The upper and lower-level winds were both near average across most of the tropical Pacific.

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ENSO-neutral conditions continued through July and August, with slightly below average sea surface temperatures (SSTs) close to the equator across the eastern tropical Pacific Ocean. While the weekly Niño-1+2 and Niño-4 regions were near average, the Niño-3 and Niño-3.4 indices were slightly below average (approaching -0.5°C) during both months. Although below-average subsurface temperatures continued, they weakened during July, but remained near the surface in parts of the central and eastern equatorial Pacific.

Though ENSO-Neutral conditions were observed during September, negative sea surface temperatures (SSTs) anomalies expanded across the eastern equatorial Pacific Ocean. All of the Niño regions cooled considerably during late September and into early October. Subsurface temperature anomalies also decreased toward the end of the month, reflecting the strengthening of below-average temperatures at depth in the east-central equatorial Pacific.



Atmospheric anomalies across the equatorial Pacific edged toward La Niña during September, with a stronger tendency toward La Niña late in the month. The traditional Southern Oscillation index and the equatorial Southern Oscillation index were positive. Overall, the combined ocean and atmosphere system reflected ENSO-Neutral during September, but were more clearly trending toward La Niña conditions.

Figure 53. Sea Surface Temperature (SST) anomalies by date and longitude, for latitudes 5°N through 5°S. (Graphic from NCEP.)

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15. CONCLUSIONS

The 2016 field program ran smoothly. The only significant equipment issue was the propeller on Hailstop 4 that incurred damage. Though a week was required for the propeller to be replaced, operations during that period (July 4-July 12) continued without impact, that is, an adequate number of aircraft were always available. All storms worthy of treatment according to the current operational guidelines were seeded in a timely way. The most significant storm day of the season was July 30th when all five aircraft seeded, and some flew multiple missions. Numerous strong storms, many having "supercell" characteristics, blossomed over the project area during the afternoon and evening, threatening many higher priority cities, including Calgary. A detailed storm summary of this day is included in this final report. Thirteen storms were recorded over or immediately adjacent to the Calgary metroplex, and all were treated. However, the storm on the 30th of July produced significant damage in portions of northeast Calgary.

The storm frequency was near normal; the season ranked eighth in terms of seeding activity. Having the fifth aircraft available allowed the project Lead Meteorologist to increase aircraft coverage when long-lived storms moved through or near a succession of municipalities, and to seed earlier at sustained, effective rates when severe storms threatened high priority cities and towns.

Bruce Boe, Vice President of Meteorology
Daniel Gilbert, Chief Meteorologist, Alberta Lead Meteorologist
Bradley Waller, Field Meteorologist
Adam Brainard, Field Meteorologist
Jody Fischer, Project Manager, Chief Pilot
Hans Ahlness, Vice President of Operations

January 2017

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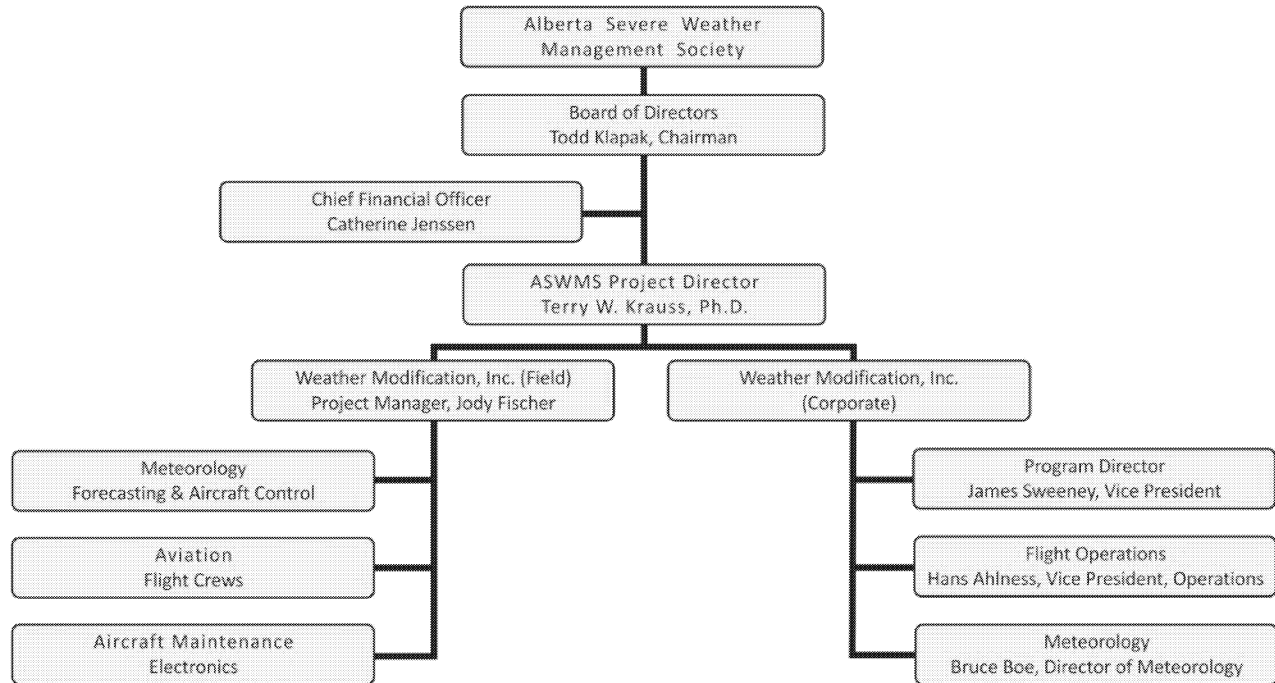
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APPENDIX A – ORGANIZATION CHART



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APPENDIX B – DAILY WEATHER AND ACTIVITIES SUMMARY TABLE

| ALBERTA HAIL SUPPRESSION PROJECT 2016 DAILY SUMMARY REPORTS | | |
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| Date | Weather | Activities Summary |
| June 1, Wednesday | <p>Winds were expected to be southwesterly at the upper levels. A shortwave trough looked to move northeastward over the region in the afternoon. The low levels would be warm and moist. A lee trough appeared likely during the late afternoon hours. Area modified model soundings showed around 400J/kg of CAPE with weak speed shear.</p> <p>A chinook arch cloud formed over the project area in the morning and persisted through the mid-afternoon hours. In the late afternoon and early evening, a few thunderstorms developed near Airdrie and north of Strathmore. These thunderstorms had a short life span and produced scattered rain showers across the area.</p> <p>Max cell top: 4.6km, 53.0 max dBz, 6.8 max VIL</p> <p>Tmax YC = 21.9C and 0.2mm of rain. Tmax QF = 21.5C and no rain. Tmax Radar = 20.6C and no rain.</p> | <p>HS2 flew a maintenance flight. The flight was airborne at 1825Z and landed at 1843Z.</p> <p>Flight Summary HS2: 1815Z-1845Z; no seeding; maintenance flight.</p> |
| June 2, Thursday | <p>Upper level winds would be increasing throughout the day as the jet stream shifted northeastward into AB. A shortwave trough looked to move eastward over southern AB in the late afternoon and early evening. PVA would be abundant and strong enough to trigger scattered thunderstorms. 500mb vertical velocities indicated the best forcing would occur over the northern project area. Low level and surface winds were expected to be out of the west and southwest. The CYQF 21Z and 00Z modified model soundings showed a moderately unstable troposphere with around 15kts of bulk shear.</p> <p>Thunderstorms formed south of Rocky MH and near Sundre during the early afternoon hours. These storms slowly pushed eastward across the entire project area during the afternoon. The convective activity then moved east of the protected area during the early evening hours.</p> <p>Max cell top: 9.1km, 57.9 max dBz, 28.8 max VIL</p> <p>Tmax YC = 22.8C and no rain. Tmax QF = 23.5C and a trace of rain. Tmax Radar = 23.3C and 0.3mm of rain.</p> | <p>No aircraft operations.</p> |
| June 3, Friday | <p>An upper level ridge of high pressure was expected to build over BC and AB. This particular type of ridge looked to be a dirty ridge in that PVA would still be present during peak heating. 500mb temperatures were expected to warm by roughly 4C during the day which would stabilize the troposphere. A 700mb thermal ridge also looked to begin building over AB. The numerical weather model output guidance appeared to be over-forecasting surface dew points and under-forecasting surface</p> | <p>HS1 flew a currency flight. The crew flew from CYBW to CYQF and then back to CYBW. The aircraft was airborne at 1526Z and landed at 1632Z.</p> <p>HS4 flew a maintenance flight. They were airborne at 1628Z and landed at 1636Z.</p> <p>HS5 flew a maintenance flight. The aircraft</p> |

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| | <p>temperatures. Modified model soundings showed anywhere from 0 to 50J/kg of CAPE during the afternoon hours.</p> <p>Fair weather cumulus, stratocumulus, and cirrus clouds were observed over the area off and on throughout the forecast period.</p> <p>No TITAN cells, 29.4 max dBz</p> <p>Tmax YC = 25.3C and no rain. Tmax QF = 24.1C and no rain. Tmax Radar = 24.6C and no rain.</p> | <p>became airborne at 1745Z and landed at 1804Z.</p> <p>Flight Summary HS1: 1510Z-1635Z; no seeding; currency flight. HS4: 1620Z-1640Z; no seeding; maintenance flight. HS5: 1730Z-1806Z; no seeding; maintenance flight.</p> |
| June 4, Saturday | <p>A broad scale upper level ridge looked to continue building over southern AB through the afternoon. In the late evening and overnight, a weak shortwave trough was expected to move eastward through the flow of the upper level ridge. The shortwave looked to track through the far northern part of the project area. The low levels and surface looked to see weak upslope flow during the evening and overnight hours. The 06Z and 09Z most unstable model soundings for CYQF indicated the troposphere would be slightly unstable during the overnight hours. Model soundings also showed drier air above 13kft MSL.</p> <p>Cirrus, altocumulus, and cumulus clouds were seen over the region through the early evening hours. The cloud cover then started to increase over the northern half of the project area around sunset. Scattered convective rain showers occurred near Bentley and Blackfalds during the overnight hours. A few sprinkles were reported in Red Deer during the nighttime hours.</p> <p>No TITAN cells, 40.8 max dBz, 1.9 max VIL</p> <p>Tmax YC = 26.7C and no rain. Tmax QF = 25.5C and no rain. Tmax Radar = 25.2C and no rain.</p> | <p>HS1 flew a currency flight. The flight was airborne at 1502Z and landed at 1551Z.</p> <p>Flight Summary HS1: 1445Z-1555Z; no seeding; currency flight.</p> |
| June 5, Sunday | <p>Light upper level winds were expected as an upper level ridge axis slowly traversed the region. Weak instability was forecast, but no significant synoptic triggers were predicted. Upslope flow was expected to foster weak convection over the foothills, but no significant weather was expected inside the project area.</p> <p>Early morning weak showers quickly exited the northeast project area Sunday morning. Clear skies then took hold across the project area, with no significant meteorological echoes the rest of the period.</p> <p>Max cell top: 33.3 max dBz, 0.6 max VIL</p> <p>Tmax YC = 25.4C and no rain. Tmax QF = 24.5C and no rain. Tmax Radar = 24.5C and no rain.</p> | <p>No aircraft operations.</p> |
| June 6, Monday | <p>A strong, slow-moving upper level ridge continued to move east across western Canada. Subtle, weak areas of vorticity advection were predicted to ride atop this ridge,</p> | <p>No aircraft operations.</p> |

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| | <p>but little PVA was expected in the project area. Warm, moist southerly surface air was forecast to foster significant instability over the project, with extremely warm temperature near 30C. A lee cyclone was modeled to develop near RMH and move east across the project Monday afternoon, enhancing upslope in the far northern project area. Significant elevated instability was anticipated overnight, but no substantive triggers were expected.</p> <p>Clear skies pervaded most of the project area through the period. There were a few towering cu producing virga near Turner Valley in the late afternoon, but no other meteorological echoes occurred on Radar. In the late evening, between 3-5Z (06/07), a strong thunderstorm did develop north of Ponoka, but remained approximately 30 n.m. north of the project area. Conditions remained quiet overnight.</p> <p>Max cell top: 33.6 max dBz, 0.7 max VIL</p> <p>Tmax YC = 30.9C and no rain. Tmax QF = 29.6C and no rain. Tmax Radar = 29.7C and no rain.</p> | |
| <p>June 7, Tuesday</p> | <p>The large upper level ridge continued to erode east through the period, with mid-level temperatures cooling considerably. A weak upper level disturbance moving across B.C. and Washington was expected to aid in convective initiation Tuesday afternoon. At the surface, a weak lee cyclone was located near the northeast corner of the project area, and was forecast to move east into Saskatchewan through the day. Surface winds were predicted to turn upslope by Tuesday afternoon, further aiding convective initiation. Instability was expected to be severe, with temperatures again near 30C and dew points around 12C. Shear was also noted to be suitable for supercellular thunderstorms. Convection was forecast to linger into the overnight hours before departing, with no further trigger mechanisms expected.</p> <p>The first convective echoes developed over the foothills northwest of Sundre and quickly advanced into the project area. The first seeded storm developed in this area at 2230Z and began turning right of the mean flow toward Bowden. It was seeded until it crossed the QE2. Storm #2 developed in the project area near Didsbury, became supercellular, and tracked toward Acme. It produced 2.5cm hail 2 miles WNW of Beiseker. Storm #3 dropped into the northwest project area and threatened RMH shortly after 0Z (06/08). The cell had pronounced rotation, and it continued east producing quarter sized hail in Eckville. It was seeded until it merged with a complex of thundershowers to the south and weakened west of Red Deer. Storm #4 developed near Sundre at 0130Z (06/08) and quickly became a LP supercell. It was seeded as it approached Olds, where it dropped up to 2.0cm hail in town. The final seeded storm, #5, developed approximately 30 miles behind storm #3 over the RMH VOR. It tracked near the RMH airport and was seeded before it moved through Sylvan and Red Deer. Weaker elevated thundershowers continued in the north central</p> | <p>HS4 was launched at 2224Z to Sundre. They were airborne at 2304Z. HS4 began base seeding storm #1 Bowden at 2319Z. They stopped seeding and repositioned to the Rocky MH VOR at 2359Z. HS4 began seeding storm #3 Rocky MH at 0024Z (06/08). They stopped seeding and RTB at 0115Z (06/08). HS4 landed at 0134Z (06/08).</p> <p>HS1 was launched at 2227Z to Sundre. They were airborne at 2259Z. HS1 began top seeding storm #1 Bowden at 2323Z. HS1 stopped seeding and repositioned to the Rocky MH VOR at 2359Z. HS1 began seeding storm #3 Rocky MH at 0023Z (06/08). HS1 stopped seeding but continued to patrol Rocky MH at 0045Z (06/08). HS1 resumed seeding storm #3 Eckville at 0105Z (06/08). HS1 stopped seeding and RTB at 0203Z (06/08). They landed at 0234Z (06/08).</p> <p>HS2 was launched at 2324Z to intensifying convection near Crossfield. They were airborne at 2337Z. HS2 started base seeding storm #2 Acme at 2359Z. They stopped seeding and repositioned to Rocky MH at 0055Z (06/08). HS2 began seeding storm #3 Eckville at 0123Z (06/08). HS2 stopped seeding and RTB at 0226Z (06/08). They landed at 0300Z (06/08).</p> <p>HS5 was launched at 2354Z for new convection. They were airborne at 0014Z (06/08). HS5 began to patrol Cochrane at 0014Z (06/08). HS5 RTB at 0038Z (06/08). They landed at 0048Z (06/08).</p> <p>HS5 was relaunched to new convection west of</p> |

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| | <p>and northeast project area through 8Z, but did not pose a significant hail risk.</p> <p>2.5cm hail was reported 2 miles WNW of Beiseker. Quarter size hail was reported north of Eckville. 2.0cm hail reported in Olds.</p> <p>Max cell top: 12.9km, 64.9 max dBz, 75.2 max VIL</p> <p>Tmax YC = 29.7C and no rain. Tmax QF = 26.9C and 0.6mm of rain. Tmax Radar = 27.6C and 2.0mm of rain.</p> | <p>Sundre at 0128Z (06/08). They were airborne at 0148Z (06/08). HS5 started top seeding storm #4 Olds at 0207Z (06/08). HS5 stopped seeding and RTB at 0303Z (06/08). They landed at 0328Z (06/08).</p> <p>HS3 was launched at 0132Z (06/08) to storm #3 Eckville. They were airborne at 0154Z (06/08). HS3 began top seeding storm #3 Sylvan-Red Deer at 0210Z (06/08). At 0227Z (06/08) HS3 stopped top seeding and dropped to base seeding altitude. They began base seeding storm #3 Sylvan-Red Deer at 0235Z (06/08). HS3 stopped seeding and repositioned to Olds at 0240Z (06/08). HS3 began base seeding storm #4 Olds at 0253Z (06/08). They stopped seeding but continued to patrol Olds at 0304Z (06/08). HS3 repositioned toward Sylvan at storm #4 at 0310Z (06/08). They began patrolling Sylvan at 0320Z (06/08). HS3 began base seeding storm #5 Sylvan at 0324Z (06/08). HS3 stopped seeding and RTB 0407Z (06/08). They landed at 0417Z (06/08).</p> <p>Flight Summary HS4: 2239Z (06/07)-0139Z (06/08); 182 min wing-tip generators, 5 BIP; #1 Bowden, #3 Rocky MH. HS1: 2245Z (06/07)-0236Z (06/08); 124 EJ, 3 BIP; #1 Bowden, #3 Rocky MH-Sylvan. HS2: 2328Z (06/07)-0302Z (06/08); 175 min wing-tip generators, 22 BIP; #2 Acme, #3 Eckville-Sylvan. HS5: 0006Z-0050Z (06/08); no seeding; patrol Cochrane. HS5: 0139Z-0330Z (06/08); 173 EJ, 7 BIP; #4 Olds. HS3: 0145Z-0420Z (06/08); 66 EJ, 24 BIP; #3 Sylvan-Red Deer, #4 Olds, #5 Sylvan.</p> |
| <p>June 8, Wednesday</p> | <p>The upper level jet was projected to move overhead as a broad upper level ridge continued to move east of the area and a strong longwave trough approached the B.C. coast. A shortwave trough was forecast to provide strong PVA to the project area mid-afternoon, initiating a strong line of thunderstorms that would move across the area. Low level moisture remained relatively high, and despite cooler surface temperatures, very high instability was anticipated during peak heating. Speed shear was modeled to be higher than previous days, but nearly unidirectional aloft. The project area was expected to stabilize following the afternoon convection, with only scattered convective rain showers overnight.</p> <p>Substantial mid and upper level clouds pervaded much of the project area in the early afternoon, significantly suppressing instability. A few convective showers developed in a broken line between Sundre and Calgary between 2000-2130Z, but struggled to deepen into appreciable hail threats, and ultimately dissipated. A second batch of convection began developing on the foothills around 22Z, and quickly became linear. Storm #1</p> | <p>HS5 was launched at 2144Z to patrol the Cochrane-Springbank area. They were airborne at 2205Z. HS5 began seeding storm #1 Cochrane at 2215Z. At 2223Z HS5 extended their track north toward new development near Sundre. HS5 began seeding storm #3 Caroline at 2238Z. HS5 stopped seeding and began patrolling north of Cochrane at 2251Z. HS5 started seeding storm #2 Didsbury at 2304Z. HS5 stopped seeding and repositioned south of Springbank at 2315Z. They repositioned again to patrol Red Deer at 2325Z. HS5 RTB at 2351Z, and landed at 0032Z (06/09).</p> <p>HS2 was launched at 2159Z for developing convection west of Springbank. They were airborne at 2218Z. HS2 began seeding storm #2 Carstairs at 2231Z. They stopped seeding and began patrolling Red Deer at 2323Z. HS2 RTB at 2351Z. They landed at 0031Z (06/09).</p> |

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| | <p>was the southernmost cell in the line and moved toward Cochrane, and was seeded until it dissipated. Storm #2 was a broad middle section of the line with several embedded thunderstorms capable of small hail. It was seeded from Cremona to Olds until the line weakened considerably and no longer posed a hail threat. Storm #3 developed on the northern flank of the line west of Sundre and briefly pulsed into a small hail threat. It was seeded for Caroline until it quickly dissipated into a rain shower and further melded with the existing line of thundershowers. A fourth, stronger, unseeded storm developed discrete from the line north of Eckville. It showed characteristics of rotation and produced the highest radar metrics (dbz, vil, echo top) of the day, but never threatened a project city as it exited north of Ponoka. Weak convective showers continued the remainder of the night in the northwest project area.</p> <p>Max cell top: 11.4km, 62.5 max dBz, 62.7 max VIL</p> <p>Tmax YC = 27.7C and 0.2mm of rain. Tmax QF = 25.9C and 1.2mm of rain. Tmax Radar = 26.6C and 1.8mm of rain.</p> | <p>Flight Summary HS5: 2153Z (06/08)-0034Z (06/09); 67 EJ, 1 BIP; #1 Cochrane, #3 Caroline, #2 Didsbury, patrol Springbank, patrol Red Deer. HS2: 2208Z (06/08)-0033Z (06/09); 104 min wing-tip generators, 4 BIP; #2 Carstairs-Didsbury, patrol Red Deer.</p> |
| <p>June 9, Thursday</p> | <p>A deep upper level trough remained off the coast of B.C., with relatively light upper level winds over the project area. A small area of PVA was creating clouds and very weak showers in the far southwest project area into southeast B.C., though no other significant PVA was expected until Friday morning. Strong insolation and starkly cooler mid-level temperatures were forecast to foster significant instability, with widespread air mass thunderstorms predicted for the central and northern project area where greater low level moisture existed. Activity was projected to diminish Thursday night, with calm conditions forecast until a new shortwave trough was predicted to bring rain into Friday morning.</p> <p>A disorganized complex of thundershowers developed between Sundre and Rocky MH early Thursday afternoon. Convection was generally weak. However a stronger thunderstorm persisted on the southern flank of the complex. This thunderstorm was the only cell seeded as it moved east from the Sundre area, over the Olds-Didsbury airport, and exited the project area near Three Hills. The storm produced penny size hail measured at the Olds-Didsbury Radar. Weak thundershowers continued across the north central project area until evening, after which no significant weather occurred.</p> <p>Penny size hail reported at the Olds-Didsbury Radar. Pea size hail reported 4 miles northwest of Sundre.</p> <p>Max cell top: 9.9km, 58.1 max dBz, 28.7 max VIL</p> <p>Tmax YC = 24.1C and no rain. Tmax QF = 21.5C and a trace of rain. Tmax Radar = 20.9C and 4.8mm of rain.</p> | <p>HS3 was launched at 1945Z for pulse thunderstorms west of Olds. They were airborne at 2000Z. HS3 began top seeding storm #1 Olds at 2017Z. HS3 stopped seeding and began to patrol west of Linden at 2055Z. They resumed top seeding storm #1 Linden at 2110Z. HS3 descended to base seed storm #1 Linden at 2113Z. They began base seeding storm #1 Linden at 2119Z. HS3 RTB at 2139Z, and landed at 2157Z.</p> <p>Flight Summary HS3: 1953Z-2204Z; 101 EJ, 12 BIP; #1 Olds to Three Hills.</p> |
| <p>June 10, Friday</p> | <p>The project area was modeled to fall in the left exit region of an upper level jet centered in northwest Montana. Strong pulses of PVA were expected to progress across</p> | <p>HS1 flew a maintenance flight. They departed Springbank at 1329Z and landed in Red Deer at 1353Z.</p> |

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| | <p>the project area throughout the period. Easterly surface winds were projected to enhance rainfall near the foothills. A slightly more unstable air mass was forecast to advect into the southern project area overnight, otherwise stable conditions were anticipated. Periods of rain showers were therefore predicted across the region, with thundershowers possible overnight in the southern project area.</p> <p>Periods of rain and weak thundershowers moved across the project area throughout the forecast period. The strongest activity occurred just west of Cremona around 530Z (06/11). No hail threats were indicated by radar, and no hail reports were received.</p> <p>Max cell top: 53.2 max dBz, 4.5 max VIL</p> <p>Tmax YC = 16.0C and 4.4mm of rain. Tmax QF = 16.6C and 2.6mm of rain. Tmax Radar = 14.8C and 0.5mm of rain.</p> | <p>HS1 flew a return maintenance flight. They departed Red Deer at 1948Z and landed in Springbank at 2029Z.</p> <p>Flight Summary HS1: 1314Z-1356Z; no seeding; maintenance flight; takeoff YBW, land YQF. HS1: 1933Z-2032Z; no seeding; maintenance flight; takeoff YQF, land YBW.</p> |
| <p>June 11, Saturday</p> | <p>A strong upper level low was modeled to move northeast into central Alberta. Vorticity advection was forecast to be near neutral or negative most of the day, with a stronger pulse of PVA predicted overnight. Low level winds were predicted to turn downslope behind a lee trough during the afternoon, quickly eroding moisture by evening. Despite the dwindling moisture, modest instability was still anticipated, and a small hail threat was predicted due to exceptionally cold temperatures aloft and strong wind shear. Convective activity was forecast to diminish with the loss of surface heating in the evening, with scattered weak showers predicted overnight.</p> <p>A broad line of weak thundershowers developed across the foothills around 17Z. Cells proceeded to move northeast across much of the central and northern project area, pulsing into marginal small hail threats (as indicated by radar) before weakening. Pea size hail was reported in one of these embedded cells at Burnstick Lake south of Rocky MH. The line moved out of the northeast buffer around 21Z, though scattered disorganized thundershowers continued across the north central project area until 330Z (06/12). Quiet, clear conditions were observed the rest of the night.</p> <p>Max cell top: 6.9km, 57.1 max dBz, 19.8 max VIL</p> <p>Pea size hail reported at Burnstick Lake.</p> <p>Tmax YC = 18.8C and 2.4mm of rain. Tmax QF = 19.4C and 2.4mm of rain. Tmax Radar = 18.8C and 0.8mm of rain.</p> | <p>No aircraft operations.</p> |
| <p>June 12, Sunday</p> | <p>An upper level trough looked to produce broad scale lift across the region through the afternoon hours. The axis of the trough appeared to shift east of the project area by late afternoon. 500mb temperatures were expected to warm by an additional 2.5C in the afternoon. Winds at the low levels and surface appeared to stay southwesterly to westerly. Downslope conditions were expected to persist throughout the forecast period. Modified model soundings</p> | <p>No aircraft operations.</p> |

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| | <p>for the region indicated that convection would be very weak across the region with no more than 100J/kg of CAPE expected.</p> <p>A band of cloud cover slid east-southeastward across the northern half of the project area in the morning. This weak convection mainly produced scattered areas of virga, but radar data suggested that a few isolated pockets of light rain showers likely fell near Innisfail. The rest of the day saw scattered cloud cover. Isolated convective rain showers then fell to the northwest of Lacombe at around the time of sunset.</p> <p>No TITAN cells, 44.4 max dBz, 4.3 max VIL</p> <p>Tmax YC = 20.7C and no rain. Tmax QF = 22.8C and a trace of rain. Tmax Radar = 22.3C and no rain.</p> | |
| <p>June 13, Monday</p> | <p>The upper level jet stream was expected to be directly over the region. At the mid-levels, a shortwave trough looked to slide northeastward across the region in the late afternoon and early evening. Moderately strong PVA appeared to be co-located with the shortwave. Low level and surface winds looked to back to more of a southeasterly direction starting in the early afternoon. Warm moist air was expected to flow into the region from the SE in the afternoon and early evening. In the late evening the ridge of warm moist air looked to begin shifting east of the area. Regional modified model soundings suggested that instability would be highest over the northern project area. Speed shear was expected be around 35kts.</p> <p>Cloud cover formed over the region in the early afternoon. Convection started developing over the foothills and inside the protected area in the late afternoon. This weak convection quickly pushed northeastward across the northern half of the region in the early evening. A few weak and isolated thunderstorms formed near the town of Eckville and east of Olds. Surface dew-points remained lower than the numerical weather model output guidance was suggesting would occur during the daytime hours. The lower dew-points resulted in less instability and energy for thunderstorm development during the time of peak heating.</p> <p>No TITAN cells, 53.2 max dBz, 6.6 max VIL</p> <p>Tmax YC = 21.9C and no rain. Tmax QF = 21.0C and no rain. Tmax Radar = 20.6C and no rain.</p> | <p>No aircraft operations.</p> |
| <p>June 14, Tuesday</p> | <p>A southerly jet looked to be over the area through the evening. Strong PVA was predicted to occur in the afternoon as a shortwave trough quickly raced northward across the area. Model data indicated that 500mb temperatures would also cool aloft which would keep the troposphere unstable. Low level winds were expected to be out of the SW to S during the daytime. At the surface, low pressure was forecasted to be centered near the Edmonton area with a lee trough extending southward</p> | <p>No aircraft operations.</p> |

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| | <p>toward the international border. The 21Z and 00Z (06/15) CYQF modified model soundings showed anywhere from 200 to 400J/kg of CAPE with 45kts of speed shear. Considering the weak instability and strong speed shear, updrafts were expected to be sheared apart.</p> <p>In the early afternoon weak convection began to form over the foothills near Limestone mountain. This cluster of convective rain showers slowly pushed northward toward the town of Rocky MH. In the late afternoon, convective rain showers then started falling near Cochrane and Sundre. These scattered rain showers then persisted over the protected area until shortly after sunset when the troposphere stabilized. Isolated thunderstorms were observed southeast of Sundre and east of Caroline during the mid-evening. Pea size hail was reported to the southeast of Sundre.</p> <p>Max cell top: 6.9km, 52.4 max dBz, 11.9 max VIL</p> <p>Tmax YC = 16.8C and 0.2mm of rain. Tmax QF = 17.7C and 0.4mm of rain. Tmax Radar = 17.9C and no rain.</p> | |
| <p>June 15, Wednesday</p> | <p>Two closed upper level lows were expected to be present over western part of North America. One of the lows looked to stay centered over northern AB and the other was forecasted to be positioned just off the coast of Washington. A shortwave trough looked to move northeastward over the far southern part of AB during the overnight hours. Downslope weather conditions were expected due to southwesterly wind flow at the low levels and surface. Area modified model soundings suggested that a slightly unstable air mass would be in place in the afternoon and evening. Other than surface heating, no significant trigger mechanisms looked to be present for TS initiation.</p> <p>Fair weather cumulus and cirrus clouds were observed over the area through around the time of sunset. Stratiform clouds then began to move into southern half over the protected area during the overnight hours.</p> <p>No TITAN cells, 24.8 max dBz, 0.1 max VIL</p> <p>Tmax YC = 16.8C and no rain. Tmax QF = 17.9C and no rain. Tmax Radar = 16.7C and no rain.</p> | <p>HS2 flew a maintenance flight. The aircraft was airborne at 1727Z and landed at 1745Z.</p> <p>HS4 flew a nighttime currency flight. The aircraft was airborne at 0518Z and landed at 0559Z.</p> <p>Flight Summary HS2: 1716Z-1747Z; no seeding; maintenance flight. HS4: 0506Z-0602Z; no seeding; currency flight.</p> |
| <p>June 16, Thursday</p> | <p>The upper level low over northern AB was expected to weaken as it started to track eastward toward SK. A trough of low pressure was forecasted to extend from the AB low southwestward to the low off the coast of Washington. Weak PVA looked to be co-located near the trough. West to southwest low level and surface winds were predicted to continue over the mountains which would favor downslope conditions. As a result, boundary layer dew-points appeared to remain relatively low. None the less, dew-points were expected to be higher over the far northern part of the project area. CYQF model soundings for the afternoon and evening showed a moderately unstable air mass over the far northern part of</p> | <p>No aircraft operations.</p> |

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| | <p>the protected area. Speed shear looked to be too weak for long-lived thunderstorms.</p> <p>A band of clouds pushed northeastward across the area during the morning hours. Virga was observed over the eastern half of the protected area from this transient cloud cover. In the late afternoon isolated weak convective rain showers fell over parts of the northern half of the project area. This convection then moved east of the region during the evening hours.</p> <p>No TITAN cells, 45.5 max dBz, 2.6 max VIL</p> <p>Tmax YC = 17.7C and no rain. Tmax QF = 18.2C and no rain. Tmax Radar = 16.4C and no rain.</p> | |
| <p>June 17, Friday</p> | <p>An upper level southwesterly jet core was expected to be centered over the SE portion of AB throughout the period. At the mid-levels, a shortwave trough looked to slide southeastward into the northern area during the mid to late afternoon. Weak PVA was anticipated with this disturbance. Dew-points within the boundary layer were predicted to remain low due to the W to SW down sloping wind flow off the mountains. Higher surface dew-points appeared to be possible over the NE quadrant of the protected area. This region was expected to see the best potential for thunderstorms development, although model sounding wind profiles for CYQF suggested short-lived thunderstorms would be possible.</p> <p>Scattered convection formed over the northern part of the region during the afternoon hours. The strongest convection of the day formed northwest of Eckville. This convection grew into a short-lived weak thunderstorm in the mid-afternoon. Scattered, light convective rain showers were observed over the rest of the area. In the early evening the convection weakened and dissipated across the entire region.</p> <p>No TITAN cells, 46.3 max dBz, 4.2 max VIL</p> <p>Tmax YC = 19.8C and no rain. Tmax QF = 18.7C and no rain. Tmax Radar = 19.3C and no rain.</p> | <p>HS1 flew a maintenance flight. The flight was airborne out of YBW at 1404Z and landed in YQF at 1425Z.</p> <p>HS1 then flew a return maintenance flight. The aircraft was airborne out of YQF at 1604Z and landed in YBW at 1630Z.</p> <p>Flight Summary HS1: 1348Z-1430Z; no seeding; maintenance flight; takeoff YBW, land YQF. HS1: 1554Z-1633Z; no seeding; maintenance flight; takeoff YQF, land YBW.</p> |
| <p>June 18, Saturday</p> | <p>A southwesterly upper level jet looked to be centered over the far SE part of AB during the daytime hours. A mid-level closed low pressure system, which was centered over the coast of Washington in the morning, was expected to move northeastward over southern AB late in the period. Due to the cyclonic rotation of the system, PVA appeared likely over the region from the late afternoon through the nighttime hours. Upslope conditions and lee-cyclogenesis looked to occur in the late afternoon into the nighttime hours. The CYYC modified model soundings for 00Z and 03Z indicated that there would be around 300J/kg of CAPE.</p> <p>During the early afternoon the cloud cover began to thicken over the region. Then in the mid-afternoon a west to east oriented line of convective rain showers formed</p> | <p>No aircraft operations.</p> |

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| | <p>over the mid portion of the protected area. This line of convection eventually moved northward across the entire northern part of the region. Starting around the time of sunset convection moved off the foothills and strengthened into a few weak thunderstorms near Okotoks and Calgary. Scattered stratiform rain showers with areas of embedded convection fell over most of the region during the overnight hours.</p> <p>Max cell top: 52.0 max dBz, 3.8 max VIL</p> <p>Tmax YC = 20.8C and a trace of rain. Tmax QF = 20.7C and 3.2mm of rain. Tmax Radar = 18.5C and a trace of rain.</p> | |
| <p>June 19, Sunday</p> | <p>A quasi-stationary low off the Washington coast was expected to remain off-shore through the forecast period. The jet stream was observed to be south of the project area. Neutral to weak negative vorticity advection was modeled for the project area throughout the forecast period. Strong insolation was predicted to foster substantial latent instability in the afternoon, producing air-mass thunderstorms across the project area. Conditions were forecast to stabilize with the loss of surface heating in the evening, with quiet conditions overnight.</p> <p>Widespread air-mass thunderstorms developed across the central and northern project area between 18 and 23Z Sunday. Individual cells were short-lived, but stronger pulses briefly produced small hail, including 1.1cm hail measured in Red Deer, and radar indicated grape size hail southeast of Blackfalds. Activity subsided into rain showers after 23Z, and completely dissipated by 02Z (06/20).</p> <p>1.1cm hail reported in Red Deer.</p> <p>Max cell top: 8.4km, 58.9 max dBz, 34.4 max VIL</p> <p>Tmax YC = 21.8C and 5.2mm of rain. Tmax QF = 22.4C and 0.2mm of rain. Tmax Radar = 20.9C and 0.5mm of rain.</p> | <p>No aircraft operations.</p> |
| <p>June 20, Monday</p> | <p>A cut-off low off the coast of Washington was forecast to rejoin the upper level flow and approach the project area as a negatively tilted trough by Tuesday morning. A zonal lobe of vorticity was modeled across the southern project area, slowly moving north, but was not producing sufficient lift for cloud cover, and was not predicted to cause significant sensible weather. Light surface winds were anticipated to turn upslope Monday afternoon, yielding thunderstorms that could drift into the northwest project area, but not strong enough to produce a significant hail threat.</p> <p>Mostly clear skies were observed across the project area throughout the day. Weak convection did form in the northwest buffer between 2230Z (06/20) and 0430Z (06/21), but only brought quickly dissipating showers across the northwest project border. A second round of rain showers began in the south central project area</p> | <p>No aircraft operations.</p> |

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| | <p>around 6Z (06/21). This activity gradually intensified; producing lightning and cell tops up to 8.4km near Cremona around 10Z, but never became an appreciable hail threat.</p> <p>Max cell top: 8.4km, 53.9 max dBz, 12.9 max VIL</p> <p>Tmax YC = 23.8C and no rain. Tmax QF = 23.9C and a trace of rain. Tmax Radar = 22.9C and no rain.</p> | |
| <p>June 21, Tuesday</p> | <p>A sharp but weakening upper level trough with strong PVA was modeled to move across southern Alberta in the afternoon. Strong insolation was forecast to cause rapid destabilization by early afternoon. At the surface, a lee low was expected to drift east near Calgary. Moisture-rich air was predicted to wrap around this low, further increasing instability in the project area. Thunderstorms capable of grape sized hail were therefore predicted Tuesday afternoon, followed by NVA and stabilizing conditions overnight.</p> <p>Morning thundershowers slowly intensified into a meridional line between Sundre and Olds. This line slowly intensified as it drifted east across the QE2, producing pea size hail in Olds, Didsbury, and at the Olds-Didsbury airport. The first seeded storm (storm #1) was a discrete cell north of the line southeast of Penhold. The cell was moving northwest, following southeast winds in a low-level cyclonic circulation centered near Olds, and was seeded until it dissipated as it moved across the QE2. The second seeded storm was a discrete cell tracking west toward Red Deer. It was briefly top seeded, but showed strong weakening on radar and was abandoned as it dissipated into a non-threatening rain shower. The last seeded storm of the day (storm #3) formed near the aforementioned line of convection east of Olds just after 19Z. It was the strongest radar indicated storm of the day, but very slow moving, following the same cyclonic motion north to northwest. It eventually became a threat for Red Deer around 2030Z, and was seeded until it became clear it would dissipate into a rain shower just before 21Z. Thundershowers continued across the southern project area through the rest of the afternoon, while a deformation band of rain covered the northern project area between Bowden and Ponoka. This activity dissipated and moved east out of the area around 1Z (06/22), with stable, clearing conditions overnight.</p> <p>Pea size hail at EA3, in Olds, and in Didsbury. Up to dime size hail in Penhold.</p> <p>Max cell top: 10.6km, 59.0 max dBz, 35.6 max VIL</p> <p>Tmax YC = 22.2C and 0.8mm of rain. Tmax QF = 22.1C and 29mm of rain. Tmax Radar = 18.9C and 11.9mm of rain.</p> | <p>A radar tour was conducted at the Olds-Didsbury airport with 16 people in attendance.</p> <p>HS3 flew a PR flight. They were airborne from YQF at 1745Z and landed at EA3 at 1800Z.</p> <p>HS2 was launched at 1840Z. They were airborne at 1903Z. HS2 began base seeding storm #1 Penhold at 1931Z. HS2 stopped seeding and began to patrol Red Deer at 2000Z. HS2 began seeding storm #3 Red Deer at 2028Z. HS2 stopped seeding and RTB at 2056Z. They landed at 2127Z.</p> <p>HS5 was launched at 1852Z. They were airborne at 1909Z. HS5 began to patrol Red Deer at 1941Z. HS5 began top seeding storm #2 Red Deer at 2018Z. They stopped seeding storm #2 at 2019Z. HS5 began seeding storm #3 Red Deer at 2027Z. HS5 stopped seeding and repositioned toward Springbank at 2052Z. HS5 began to patrol Cochrane at 2107Z. HS5 RTB at 2121Z. They landed at 2131Z.</p> <p>HS3 flew a return PR flight. They were airborne from EA3 at 2308Z and landed at YQF at 2330Z.</p> <p>Flight Summary HS3: 1738Z-1804Z; no seeding; PR flight; takeoff YQF, land EA3. HS2: 1850Z-2129Z; 124 min wing-tip generators, 0 BIP; #1 Penhold, #3 Red Deer. HS5: 1900Z-2134Z; 50 EJ, 3 BIP; #2 Red Deer, #3 Red Deer. HS3: 2300Z-2335Z; no seeding; PR flight; takeoff EA3, land YQF.</p> |
| <p>June 22, Wednesday</p> | <p>The project area was forecast to remain north of jet-level disturbances through the period. A modest pulse of PVA was expected in the northern project area in the late afternoon. Diurnal upslope conditions were expected to</p> | <p>HS3 was launched at 0127Z (06/23) for a pulsing thunderstorm west of Red Deer. They were airborne at 0148Z (06/23). HS1 began top seeding storm #1 Blackfalds at 0156Z</p> |

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| | <p>foster foothills convection in the afternoon, gradually pushing into the northwest project area by late afternoon, and across the entire northern project area by evening. Instability and boundary layer moisture was anticipated to be a limiting factor in storm severity, with shear indicative of linear convection. Minor elevated instability was predicted to linger overnight, though no organized forcing mechanisms were foreseen.</p> <p>Weak air-mass showers began to develop across the northern project area around 18Z. Convection gradually expanded in coverage and intensified into a broken band of showers that stretched from the northern buffer south to the Springbank area by 22Z. Stronger cells began to develop in this band south of Eckville at 23Z, briefly became a hail threat for Sylvan just before 0Z (06/23), but quickly pulsed down into a non-threatening rain shower. At 0030Z (06/23) this convection re-intensified, and moved left the mean flow to the north, tracking immediately west of Sylvan. Radar indicated up to grape size hail may have fallen 4 nm WNW of Sylvan. The storm then made a sharp right turn, and threatened Blackfalds. It was seeded (storm #1) as it moved east toward town, but was abandoned after it passed the QE2 just north of Blackfalds at 0212Z (06/23).</p> <p>Max cell top: 9.1km, 59.6 max dBz, 33.9 max VIL</p> <p>Tmax YC = 25.2C and 0.2mm of rain. Tmax QF = 23.5C and no rain. Tmax Radar = 22.8C and no rain.</p> | <p>(06/23). They stopped seeding and RTB at 0212Z (06/23), and landed at 0222Z (06/23).</p> <p>Flight Summary HS3: 0133Z-0228Z (06/23); 69 EJ, 3 BIP; #1 Blackfalds.</p> |
| <p>June 23, Thursday</p> | <p>An upper level low was modeled to move onshore near Victoria, B.C., bringing the project area into the left exit region of a jet streak in the afternoon. PVA was also expected during peak heating Thursday afternoon. Strong insolation was occurring throughout the project area, which was forecast to foster CAPE up to 1000J/kg by mid-afternoon. Modest shear was also predicted, with some storm organization possible. Elevated instability was anticipated into the overnight hours, though hail threats were expected to subside by midnight.</p> <p>Convective showers began developing off the foothills and moving into the western project area around 1830Z. This activity gradually grew into a line along the western project boundary, with embedded storms posing a small hail risk to the project area. One of these cells, on the southern flank, posed a threat to Cochrane. It was seeded (storm #1) until it passed the QE2 north of Airdrie. A second stronger embedded cell formed in this line southwest of Red Deer at 2130Z. It was patrolled as it approached the city, but never became an organized hail threat. Additional development near Okotoks also warranted patrol, but again, did not develop into an organized hail threat. Embedded thundershowers continue to track east across the project, eventually moving out of the east buffer around 0130Z (06/24). At the same time, new convection began to organize in the northwest project area. The convection then drifted east across the area. A longer lived thunderstorm (storm #2) developed near Sundre and moved east toward the Olds</p> | <p>HS2 was launched at 2011Z for deepening convection west of Cochrane. They were airborne from YBW at 2024Z. HS2 began base seeding storm #1 Cochrane at 2032Z. HS2 stopped seeding and RTB Olds at 2105Z. They landed at EA3 at 2118Z.</p> <p>HS1 was launched at 2027Z for a thunderstorm southwest of Cochrane. They were airborne at 2047Z. HS1 started top seeding storm #1 for Airdrie at 2102Z. HS1 stopped seeding and began to patrol Cochrane at 2115Z. They RTB at 2127Z, and landed at 2138Z.</p> <p>HS2 was relaunched at 2158Z for intensifying convection west of Innisfail. They were airborne from EA3 at 2212Z. HS2 began to patrol Red Deer at 2215Z. They did not find suitable inflow, and repositioned to Turner Valley at 2231Z. HS2 began patrolling Okotoks at 2306Z. HS2 RTB to Springbank at 2319Z. They landed at YBW at 2329Z.</p> <p>HS4 flew a maintenance flight. They took off at 2308Z and landed at 2349Z.</p> <p>HS4 was launched at 0113Z (06/24) to a storm along the foothills to the west of Rocky MH. The flight became airborne at 0126Z (06/24).</p> |

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| | <p>area before weakening. The strongest thunderstorm of the day formed southwest of Rocky MH and tracked eastward through Sylvan and Red Deer. Radar data indicated grape size hail may have fallen west of Sylvan.</p> <p>Max cell top: 9.9km, 59.2 max dBz, 50.9 max VIL</p> <p>Tmax YC = 24.0C and a trace of rain. Tmax QF = 22.3C and 2.6mm of rain. Tmax Radar = 21.4C and 0.3mm of rain.</p> | <p>The aircraft started patrolling the Rocky MH area starting at 0150Z (06/24). HS4 then repositioned to stronger convection near Sundre at 0152Z (06/24). They started base seeding storm #2 for Olds at 0215Z (06/24). At 0226Z (06/24) HS4 stopped seeding storm #2 and repositioned to Eckville, leaving burners on while in transit. HS4 then started seeding storm #3 for Sylvan 0235Z (06/24). Then at 0354Z (06/24) they stopped seeding and RTB. The flight landed at 0430Z (06/24).</p> <p>HS3 was launched to a growing storm near Sundre at 0156Z (06/24). The aircraft was airborne at 0218Z (06/24). HS3 started top seeding storm #2 for Olds beginning at 0234Z (06/24). They then stopped seeding at 0255Z (06/24) and repositioned to a thunderstorm tracking toward Sylvan. HS3 started top seeding storm #3 for Sylvan at 0309Z (06/24). At 0349Z (06/24) the aircraft stopped seeding and RTB. They landed at 0413Z (06/24).</p> <p>HS2 was launched at 0237Z (06/24) to a long-lived thunderstorm to the west of Olds. The flight became airborne at 0251Z (06/24). HS2 started base seeding storm #3 for Sylvan at 0310Z (06/24). At 0350Z (06/24) they stopped seeding and RTB. The aircraft landed at 0418Z (06/24).</p> <p>Flight Summary HS2: 2016Z-2120Z; 66 min wing-tip generators, 5 BIP; #1 Cochrane to Airdrie; takeoff YBW, land EA3. HS1: 2034Z-2143Z; 23 EJ, 0 BIP; #1 Airdrie. HS2: 2207Z-2331Z; no seeding; patrol Red Deer, patrol Okotoks; takeoff EA3, land YBW. HS4: 2259Z-2355Z; no seeding; maintenance flight. HS4: 0121Z -0434Z (06/24); 198 minutes wing-tip generators, 14 BIP; #2 Olds, #3 Sylvan to Red Deer, patrol Rocky MH. HS3: 0204Z-0418Z (06/24); 75 EJ, 12 BIP; #2 Olds, #3 Sylvan to Red Deer. HS2: 0244Z-0422Z (06/24); 39 minutes wing-tip generators, 7 BIP; #3 Sylvan to Red Deer.</p> |
| <p>June 24, Friday</p> | <p>An upper level low was expected to move across far southern Alberta throughout the day. PVA was modeled to favor the southern project area, though air-mass thunderstorms were expected across the region. At the surface, a weak low was forecast to develop across the far southern project area, with moisture wrapping around the northwest flank. Instability was modeled to be relatively high, but weak, disorderly winds aloft were predicted to keep storm severity muted. Thunderstorms were expected to weaken and consolidate into a mass of rain showers by late evening, with rain continuing overnight.</p> <p>Convective showers near Limestone Mountain began to</p> | <p>HS2 was launched at 2018Z. They were airborne at 2033Z. HS2 began base seeding storm #1 Calgary at 2042Z. At 2055Z, HS2 repositioned to new growth southwest of Calgary, leaving wing-tip generators on in-transit. They began seeding this cell, storm #2 for Calgary, at 2100Z. HS2 stopped seeding and RTB at 2226Z. They landed at 2234Z.</p> <p>HS5 was launched at 2150Z for developing convection near Airdrie. They were airborne at 2208Z. HS5 began base seeding storm #3 Airdrie at 2216Z. HS5 stopped seeding and repositioned toward Strathmore at 2224Z,</p> |

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| | <p>drift east into the northwest project area around 1730Z. Activity slowly intensified into the afternoon, and began to form sporadically across the project area around 1930Z. One such cell formed directly over north Calgary at 20Z, and briefly produced pea to dime size hail in town. The cell was nearly stationary, and was seeded (storm #1) along with a second cell to the southwest (storm #2) until the cells rained out and dissipated. A third storm was seeded when it developed near Airdrie at 2215Z (storm #3), but it never became a radar-indicated hail threat. Pulse, quasi-stationary convection continued across the central and southern project area through 0Z (06/25), after which a broad area of rain enveloped the central and eastern project. This moved out of the region around 7Z (06/25), but was followed by a second broad mass of convective rain showers that moved south across the project area into Saturday morning.</p> <p>Max cell top: 9.9km, 59.8 max dBz, 43.8 max VIL</p> <p>Dime size hail reported in Calgary.</p> <p>Tmax YC = 20.4C and 22.2mm of rain. Tmax QF = 20.3C and 14.0mm of rain. Tmax Radar = 18.8C and 5.8mm of rain.</p> | <p>climbing to top seeding altitude in flight. HS5 started patrolling Strathmore at 2239Z. They RTB at 2307Z, and landed at 2331Z.</p> <p>Flight Summary HS2: 2027Z-2237Z; 208 min wing-tip generators, 4 BIP; #1 Calgary, #2 Calgary. HS5: 2201Z-2335Z; 0 EJ, 2 BIP; #3 Airdrie, patrol Strathmore.</p> |
| <p>June 25, Saturday</p> | <p>A shortwave ridge was forecast to move toward the region Saturday afternoon, with negative vorticity advection becoming neutral by late evening. Significant latent instability was expected with sun breaking through morning clouds and showers, and elevated instability was modeled to linger through the overnight hours. Wind shear was predicted to remain low, though cell motion was notably stronger than previous days. Pulse thunderstorms capable of small hail were anticipated throughout the afternoon, with scattered convection lingering into the overnight hours.</p> <p>A broad band of convective rain showers moved southeast across the project area early Saturday, followed by patchy clearing by late morning. This clearing led to rapid destabilization of the environment, and scattered thunderstorms quickly followed across the project area from late morning throughout the afternoon. All thunderstorms were short-lived, but a few pulsed into minor hail threats. Convective cells threatening the Cochrane and Red Deer area were patrolled during peak heating, but no notable hail threats materialized. The tallest radar indicated cell was north of Olds, and moved southeast producing pea size hail 20km east of town. The strongest radar indicated storm was in the east buffer north of Three Hills, and briefly produced radar-indicated grape size hail. Convection weakened after 0030Z (06/26), though broad bands of rain showers continued throughout the night.</p> <p>Max cell top: 8.4km, 60.3 max dBz, 36.7 max VIL</p> <p>Pea size hail reported 20km east of Olds.</p> <p>Tmax YC = 20.7C and 7.4mm of rain. Tmax QF = 21.4C and 1.4mm of rain.</p> | <p>HS1 was launched for patrol over Cochrane at 2202Z. They were airborne at 2224Z. HS1 began to patrol Cochrane at 2230Z. HS1 RTB at 2319Z and landed at 2331Z.</p> <p>HS3 was launched at 2230Z to patrol Red Deer. They were airborne at 2249Z. HS3 began to patrol Red Deer at 2255Z. HS3 RTB at 2302Z, and landed at 2308Z.</p> <p>Flight Summary HS1: 2218Z-2334Z; no seeding; patrol Cochrane. HS3: 2238Z-2313Z; no seeding; patrol Red Deer.</p> |

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| | Tmax Radar = 19.2C and 7.1mm of rain. | |
| June 26, Sunday | <p>An upper level ridge was expected to gradually build over the region throughout the period. None the less, a weak lobe of PVA looked to push eastward across the region in the late afternoon into evening. This was expected to be the primary trigger for thunderstorms other than surface heating. Wind flow at the mid-levels was forecasted to be out of the northwest and temperatures at 500mb (~18kft) would warm by at least 1.5C during the daytime. The 21Z modified model soundings for CYQF and CYYC indicated the troposphere would be moderately unstable with 500 to 700J/kg of CAPE. Model sounding wind profiles showed bulk speed shear values of only around 5kts which suggested that thunderstorms would be short-lived.</p> <p>Scattered rain showers fell over the area during the morning. In the early afternoon the skies cleared across most of the area and convection developed along the foothills west of Cremona, Cochrane, and Turner Valley. This convection was short-lived and dissipated as it moved southeastward into the project area during the mid-afternoon. Isolated, light convective rain showers were observed from this convection within the protected area. The thunderstorm activity stayed just to the east of the region during the afternoon and evening.</p> <p>No TITAN cells, 45.9 max dBz, 1.6 max VIL</p> <p>Tmax YC = 21.1C and 2.8mm of rain. Tmax QF = 21.5C and a trace of rain. Tmax Radar = 21.0C and no rain.</p> | No aircraft operations. |
| June 27, Monday | <p>The upper level jet stream was predicted to stay south of the area, over Idaho and Montana, throughout the period. The mid-level ridge was expected to remain in place through the afternoon. Starting in the evening the ridge was forecasted to flatten as a shortwave trough slowly approached the area from the SW. Little to no PVA was expected during the daytime. Slightly better PVA looked to occur overnight as the shortwave began to approach the area. Warm moist air appeared to be in place at the low levels from the late afternoon through overnight hours. Area modified model soundings showed close to 1000J/kg of CAPE with weak speed shear. The tropopause was predicted to be at 40kft MSL.</p> <p>Towering cumulus, altocumulus, altostratus, and cirrus clouds formed over the region off and on throughout the daytime hours. Overnight, elevated thunderstorms formed near Rocky MH, Eckville, and Innisfail. Radar data indicated pea size hail may have fallen to the northwest of Eckville during the late overnight hours.</p> <p>Max cell top: 8.4km, 56.8 max dBz, 25.9 max VIL</p> <p>Tmax YC = 25.4C and no rain. Tmax QF = 25.2C and no rain. Tmax Radar = 23.7C and no rain.</p> | No aircraft operations. |
| June 28, Tuesday | Upper level jet energy was expected to be centered over the far southern part of AB. A shortwave trough with | Radar tour #2 was conducted at the Olds-Didsbury airport and 11 people were in |

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| | <p>moderately strong PVA was forecasted to push eastward across the area in the afternoon. Thunderstorms were expected to first trigger along the foothills before moving into the project area. Low level and surface winds looked to be southeasterly to easterly, favoring upslope flow. Warm moist air was predicted to be advected into the region from the SE. Area modified model soundings showed a very unstable air mass in place across the region during the afternoon hours. Directional wind shear was forecasted to be present. The only variable that appeared to be lacking was speed shear. 0 to 6 km bulk speed shear values were only expected to be around 10kts.</p> <p>Elevated thunderstorms formed over the region during the morning hours. Radar data indicated pea size hail may have fallen to the south of Three Hills in the morning. In the early afternoon convection quickly developed along the foothills. Storm #1 intensified over the foothills southwest of Cremona and tracked eastward off the foothills. The next storm (#2) of the day formed to the northwest of Cochrane and moved toward the Cochrane area. This storm grew taller and stronger as it gradually moved southeastward through Cochrane and southwestern Calgary. In the meantime, the northern part of the project area saw multicellular thunderstorms. The third storm of the day formed along the foothills southwest of Calgary and slowly moved southeastward through Okotoks. According to radar data this storm (#3) may have produced walnut sized hail to the east of Okotoks. The fourth storm strengthened along the foothills west of Black Diamond and Turner Valley. This storm (#4) moved southeastward through these two towns and eventually pushed through High River. In the evening the convection diminished across the area and no significant weather occurred overnight.</p> <p>2.5cm size hail was reported east of Okotoks. Several reports of widespread pea size hail covering the ground in Okotoks. Grape size hail was also reported in Okotoks. Pea and 1.0cm size hail reported in Cochrane. Areas of flooding in the Oakridge, Cedarbrae, Braeside, and Woodbine subdivisions in southwestern Calgary.</p> <p>Max cell top: 11.4km, 64.0 max dBz, 86.6 max VIL</p> <p>Tmax YC = 24.2C and 2.6mm of rain. Tmax QF = 23.1C and a trace of rain. Tmax Radar = 23.4C and 2.5mm of rain.</p> | <p>attendance.</p> <p>HS2 flew a PR flight. The aircraft was airborne out of YBW at 1739Z and landed in EA3 at 1800Z.</p> <p>HS1 was launched to growing convection NW of the Cochrane area at 1804Z. The flight became airborne out of YBW at 1824Z. They started patrolling NW of the Cochrane area at 1829Z. HS1 began top seeding storm #1 for Airdrie at 1919Z. Then at 1923Z HS1 repositioned to another cell to the south, and at 1928Z they started top seeding storm #2 for Cochrane. The crew continued seeding the thunderstorm as it approached Calgary. At 2050Z HS1 was then out of seeding material, so they stopped seeding and RTB. The aircraft landed in EA3 at 2112Z.</p> <p>HS4 was launched at 1910Z to a growing thunderstorm northwest of Cochrane. The aircraft was airborne at 1929Z. They started seeding storm #2 for Cochrane at 1954Z. At 2125Z HS4 continued seeding as they repositioned to another storm to the northwest of Okotoks. At 2131Z they started seeding storm #3 for Okotoks. HS4 then became low on fuel and was out of seeding material, so they stopped seeding and RTB at 2234Z. The flight landed at 2307Z.</p> <p>HS5 was launched to a quickly intensifying storm west of Cochrane. They were airborne at 1935Z. At 1942Z HS5 started base seeding storm #2 for Cochrane. They then climbed to the top seeding altitude west of the storm at 2127Z in order to replace HS1 with top seeding. HS5 then started top seeding storm #3 for Okotoks at 2142Z. Next, the aircraft stopped seeding and repositioned to another growing storm northwest of Turner Valley and Black Diamond at 2211Z. They started top seeding storm #4 for Black Diamond at 2215Z. The crew continued seeding the storm as it approached High River. Then at 2306Z they stopped seeding and RTB. The flight landed at 2321Z.</p> <p>HS3 was launched at 1948Z to a growing storm west of Innisfail. The aircraft was airborne at 2014Z. The crew started top seeding storm #2 for Calgary at 2052Z. HS3 then descended to shed ice at 2127Z. Next, the aircraft started base seeding storm #3 for Okotoks at 2142Z. At 2219Z HS3 stopped seeding and was redirected to a strengthening storm near Turner Valley and Black Diamond. They started base seeding storm #4 for Turner Valley and Black Diamond at 2223Z. The crew continued seeding this storm as it moved toward High River. At 2250Z HS3 was low on</p> |
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| | | <p>fuel, so they stopped seeding and RTB. The aircraft landed at 2323Z.</p> <p>HS2 was launched to a tall thunderstorm moving toward Calgary at 2021Z. The flight became airborne at 2032Z. HS2 started seeding storm #2 for Calgary at 2047Z. Then at 2135Z HS2 repositioned to a new cell moving toward Okotoks. The aircraft continued seeding as it repositioned to this new storm. HS2 started seeding storm #3 for Okotoks at 2142Z. At 2223Z they extended their seeding line farther to the west and started seeding storm #4 for Turner Valley and Black Diamond. HS2 then continued seeding the storm as it tracked southeastward toward High River. At 2305Z the crew stopped seeding and RTB. They landed at 2323Z.</p> <p>HS1 flew a maintenance flight. The flight was airborne out of EA3 at 2224Z and landed in YQF at 2239Z.</p> <p>Flight Summary HS2: 1729Z-1803Z; no seeding; PR flight; takeoff YBW, land EA3. HS1: 1814Z-2114Z; 297 EJ, 12 BIP; #1 Airdrie, #2 Cochrane to Calgary; takeoff YBW, land EA3. HS4: 1922Z-2311Z; 320 minutes wing-tip generators, 24 BIP; #2 Cochrane to Calgary, #3 Okotoks. HS5: 1930Z-2323Z; 199 EJ, 26 BIP; #2 Cochrane to Calgary, #3 Okotoks, #4 Black Diamond to High River. HS3: 2006Z-2328Z; 145 EJ, 26 BIP; #2 Calgary, #3 Okotoks, #4 Black Diamond to High River. HS2: 2028Z-2325Z; 276 minutes wing-tip generators, 21 BIP; #2 Calgary, #3 Okotoks, #4 Black Diamond to High River; takeoff EA3, land YBW. HS1: 2219Z-2243Z; no seeding; maintenance flight; takeoff EA3, land YQF.</p> |
| <p>June 29, Wednesday</p> | <p>The upper level jet was predicted to be centered over central AB, although jet PVA looked to be minimal. A mid-level ridge appeared to build over southern AB from the south during the daytime. A weak shortwave trough, with weak PVA, was forecasted to ride through flow of the ridge around the time of peak heating. Warm moist air advection appeared to continue throughout the period from the southeast. Surface pressure values were expected to fall gradually throughout the day and night. Modified model soundings for CYYC and CYQF suggested a very unstable air mass would be in place over the area. Convective temperatures looked to be higher over the eastern half of the region.</p> <p>Tall thunderstorms started growing over the mountains and foothills during the early afternoon. In the late afternoon a few of these storms became more organized</p> | <p>HS4 was launched at 2303Z to a growing cell forming directly over Red Deer. The aircraft became airborne at 2327Z, and they immediately began seeding storm #1 for Red Deer. Then at 2341Z HS4 stopped seeding and RTB. The aircraft landed at 2352Z.</p> <p>Flight Summary HS4: 2317Z-2355Z; 26 minutes wing-tip generators, 0 BIP; #1 Red Deer.</p> |

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| | <p>and tracked south-southeastward along the foothills. These storms dissipated as they tried to move off the foothills. At roughly 2230Z towering cumulus clouds began to form near the Red Deer area. This weak convection (storm #1) gradually grew as it slowly tracked eastward through Red Deer. Starting around the time of sunset thunderstorms grew southwest of High River and north of Rocky MH. These TITAN cells were weak and short-lived. During the late overnight hours another thunderstorm formed near Lacombe and Ponoka. Radar indicated pea size hail may have fallen near Ponoka from this storm.</p> <p>Max cell top: 8.4km, 55.7 max dBz, 20.5 max VIL</p> <p>Tmax YC = 25.5C and no rain. Tmax QF = 26.2C and no rain. Tmax Radar = 24.2C and no rain.</p> | |
| <p>June 30, Thursday</p> | <p>The upper level ridge was expected to shift to the east as a potent negatively tilted trough quickly approached the area in the early afternoon. Two waves of PVA looked to occur, the first one was expected to push through around 18Z and the second appeared to slide across the region in the late afternoon. Warm moist air was predicted to continue being advected into the area from a southeasterly low level jet. Surface pressure had been falling during the morning and looked to continue steadily falling into the afternoon hours. Modified model soundings for the area were suggesting the troposphere would be extremely unstable with directional shear in the low levels. Modified model soundings also showed a curved hodograph in the low levels of the troposphere which indicated the possibility for supercellular development. The only parameter that appeared to be lacking was speed shear. The 0 to 6km bulk speed shear was forecasted to be only around 10kts.</p> <p>Thunderstorms quickly formed over the foothills during the early morning hours. This convection morphed into a north to south oriented, quasi linear line of thunderstorms extending across the entire project area. This line quickly tracked east-northeastward across the region in the late morning and early afternoon. Behind this line of thunderstorms another wave of convection quickly developed along the foothills in the early afternoon. During this same time a storm formed along the foothills west of Cochrane. The storm (#1) intensified as it continued to develop over the foothills at 1940Z. The thunderstorm then dissipated as it tried to move eastward toward Cochrane. The next storm (#2) of the afternoon developed west of Didsbury and moved northeastward toward the town of Olds. Another storm then formed along the foothills southwest of Cremona at around 1930Z. This storm (#3) quickly moved off the foothills toward Crossfield and Airdrie. Explosive growth then occurred southwest of Calgary and storm #4 then tracked eastward across the southern part of Calgary. During the midafternoon thunderstorms continue to develop to the south of Calgary. All these storms developed and merged into another north-south oriented line of thunderstorms which tracked eastward across entire project area. In the</p> | <p>HS2 was launched at 1648Z to a cluster of TITAN cells to the southwest of High River. They became airborne at 1707Z. HS2 started patrolling for Calgary at 1710Z. At 1727Z the storms were continuing to diminish, so they stopped patrolling and RTB. The flight landed at 1747Z.</p> <p>HS4 was launched to a fast moving thunderstorm near Sundre at 1651Z. The flight was airborne at 1712Z. At 1715Z there were no hail threats observed, so they were directed to RTB. The aircraft landed at 1722Z. Pilots reported failure of the right wing-tip generator.</p> <p>HS3 was launched to a thunderstorm to the southwest of Innisfail at 1810Z. The flight was airborne at 1826Z. At 1837Z HS3 started patrolling for Innisfail at the base seeding altitude. They were then redirected to the west of Olds in order to patrol at the top seeding altitude for this area at 1903Z. HS3 then started top seeding storm #2 for Olds at 1906Z. The crew then stopped seeding and started patrolling for Red Deer at 1915Z. HS3 stopped patrolling and RTB at 1935Z. They landed at 1945Z.</p> <p>HS5 was launched to new growth southwest of Cochrane at 1830Z. At 1845Z they were airborne and immediately started patrolling for Cochrane. HS5 then started top seeding storm #1 for Cochrane at 1910Z. At 1951Z they stopped seeding and started patrolling the same area for Calgary. At 1953Z HS5 was redirected to a storm quickly moving off the foothills toward Airdrie. They started patrolling for Crossfield at 2009Z. At 2021Z HS5 repositioned to an intensifying TITAN cell west of Calgary. The aircraft then dropped down to the base seeding altitude at 2041Z while in enroute to the storm approaching Calgary. They then started base seeding storm #4 for</p> |

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| | <p>late afternoon a storm (#4) intensified over the foothills west of Rocky MH. Storm #5 formed to the northwest of Rocky MH and tracked southeastward through the Rocky MH area. Radar data indicated walnut size hail may have fallen to the northwest of Rocky MH from this storm (#5). The sixth seeded storm for the day formed over the foothills west of Caroline and moved southeastward toward Sundre. Another thunderstorm (storm #7) intensified northwest of Sundre and pushed southeastward through Sundre. This storm eventually diminished as it moved southeastward toward Crossfield and Airdrie. The final storm of day formed near Eckville. This storm (#8) pushed eastward through Sylvan and Red Deer. The convection across the area gradually weakened and dissipated during the early nighttime hours.</p> <p>Toonie size hail reported in the Queensland part of southern Calgary. Quarter size hail reported in southwest Calgary. A tornado was observed near Ponoka.</p> <p>Max cell top: 12.9km, 65.6 max dBz, 71.2 max VIL</p> <p>Tmax YC = 23.4C and 13.0mm of rain. Tmax QF = 21.6C and 2.0mm of rain. Tmax Radar = 22.5C and 2.5mm of rain.</p> | <p>Calgary at 2044Z. HS5 stopped seeding and RTB at 2119Z. They landed at 2135Z.</p> <p>HS2 was launched at 1831Z to a growing storm SW of Cochrane. The aircraft became airborne at 1845Z and started immediately patrolling for Cochrane. HS2 then started seeding storm #1 for Cochrane at 1900Z. At 2009Z they stopped seeding and started patrolling for Calgary. They started seeding storm #4 for Calgary at 2023Z. HS2 then stopped seeding and RTB at 2119Z. The aircraft landed at 2141Z.</p> <p>HS4 was launched to a storm southwest of Cremona moving off the foothills toward Airdrie at 1946Z. They became airborne at 2002Z. HS4 started seeding storm #3 for Innisfail at 2016Z. They stopped seeding and RTB at 2058Z. The flight landed at 2113Z.</p> <p>HS3 was launched at 2002Z to a growing storm near Innisfail. The aircraft was airborne at 2045Z. At 2104Z the flight started patrolling the Sundre area. HS3 then stopped patrolling and RTB at 2117Z. They landed at 2127Z.</p> <p>HS1 flew a maintenance flight. They were airborne out of YQF at 2328Z and landed in YBW at 2349Z.</p> <p>HS4 was launched at 2345Z to an intensifying storm west of Rocky MH. The flight became airborne at 0001Z (07/01). They started seeding storm #5 for Rocky MH at 0022Z (07/01). The right generator was inoperable throughout the seeding mission. At 0041Z (07/01) HS4 then continued seeding as they repositioned to a new TITAN cell moving southeastward toward Sundre. At 0047Z (07/01) the crew started seeding storm #6 for Sundre. HS4 then stopped seeding and started patrolling for Sundre at 0102Z (07/01). At 0118Z (07/01) HS4 aborted their RTB due to a storm threatening to move through the Sylvan area. They started seeding storm #8 for Sylvan at 0128Z (07/01). At 0147Z (07/01) HS4 stopped seeding and started patrolling the Sylvan area. They stopped patrolling and RTB at 0157Z (07/01). The aircraft landed at 0205Z (07/01).</p> <p>HS5 was launched to a thunderstorm moving southeastward toward Sundre at 0038Z (07/01). They were airborne at 0100Z (07/01). The crew began patrolling the Sundre area at 0118Z (07/01). At 0124Z (07/01) HS5 started top seeding storm #7 for Sundre. They then stopped seeding at 0255Z (07/01) and RTB. The flight landed at 0305Z (07/01).</p> <p>HS3 was launched at 0137Z (07/01) to a</p> |
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| | | <p>growing storm moving toward Sundre. The flight became airborne at 0150Z (07/01). HS3 started patrolling for Red Deer at 0205Z (07/01). They then started top seeding storm #8 for Red Deer at 0215Z (07/01). At 0224Z (07/01) HS3 stopped seeding and started patrolling for Red Deer. The aircraft stopped patrolling and RTB at 0228Z (07/01). They landed at 0236Z (07/01).</p> <p>Flight Summary HS2: 1657Z-1750Z; no seeding; patrol Calgary and Strathmore. HS4: 1701Z-1725Z; no seeding; maintenance flight. HS3: 1818Z-1950Z; 18 EJ, 1 BIP; patrol Innisfail, #2 Olds, patrol Red Deer. HS5: 1837Z-2138Z; 17 EJ, 20 BIP; #1 Cochrane, patrol Crossfield, #4 Calgary. HS2: 1837Z-2143Z; 250 minutes wing-tip generators, 13 BIP; #1 Cochrane, #4 Calgary. HS4: 1955Z-2116Z; 84 minutes wing-tip generators, 0 BIP; #3 Innisfail. HS3: 2037Z-2132Z; no seeding; patrol Sundre. HS1: 2313Z-2351Z; no seeding; maintenance flight; takeoff YQF, land YBW. HS4: 2355Z (06/30)-0208Z (07/01); 65 minutes wing-tip generators, 3 BIP; #5 Rocky MH, #6 Sundre, #8 Sylvan. HS5: 0054Z-0308Z (07/01); 176 EJ, 10 BIP; #7 Sundre. HS3: 0143Z-0243Z (07/01); 0 EJ, 3 BIP; #8 Red Deer.</p> |
| <p>July 1, Friday</p> | <p>Weak upper level jet PVA was expected to be possible in the late afternoon and evening as a jet streak rounded the south end of the closed low sitting over the Gulf of Alaska. A shortwave trough was located over Vancouver Island in the morning and appeared to reach the project area roughly around the time of peak heating. Moderately strong PVA looked to occur from the time of peak heating through the time of sunset. Winds were predicted to be out of the SE at the low levels and surface, and a theta-e ridge was expected to remain in place throughout the period. Modified model soundings for the region showed a moderately unstable air mass. Model output data suggested the convection would be linear in nature.</p> <p>Isolated weak convection formed along the foothills during the mid-afternoon and late afternoon hours. In the evening thunderstorms grew along the northern foothills and then began tracking into the project area at around 01Z (07/02). Starting at roughly 02Z explosive growth occurred south of Sundre. This convection quickly intensified into a discrete supercell (storm #1) which tracked eastward through the towns of Didsbury and Linden. A tornado was spotted with this storm near the town of Bergen. Then at roughly 04Z (07/02) a new TITAN cell (storm #2) developed north of the Sundre area and tracked eastward through Olds. These two storms eventually merged into a MCS (mesoscale convective system) which tracked eastward across AB during the</p> | <p>HS4 was launched at 0254Z (07/02) to a long-lived TITAN cell moving toward Didsbury. The flight became airborne at 0307Z (07/02). HS4 began seeding storm #1 for Didsbury at 0331Z (07/02). They continued seeding this storm as it moved through Didsbury and toward Linden. At 0423Z (07/02) HS4 stopped seeding and RTB. They landed at 0442Z (07/02).</p> <p>HS3 was launched to a growing thunderstorm west of Didsbury at 0300Z (07/02). The aircraft was airborne at 0319Z (07/02). At 0336Z (07/02) HS3 started top seeding storm #1 for Didsbury. The crew continued seeding as it moved toward Didsbury. Then at 0408Z (07/02) the crew stopped seeding and repositioned to the Sundre area. HS3 started top seeding storm #2 for Olds at 0416Z (07/02). At 0433Z (07/02) they stopped seeding and reposition to a stronger storm threatening Linden. HS3 resumed top seeding storm #1 for Linden at 0435Z (07/02). They then stopped seeding at 0448Z (07/02) and repositioned to an intensifying TITAN cell moving eastward toward Olds. The crew then resumed top seeding storm #2 for Olds at 0455Z (07/02). HS3 repositioned again to storm #1 at 0513Z (07/02). They resumed seeding storm #1 for</p> |

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| | <p>overnight hours.</p> <p>Golf ball size hail fell near Linden. Pea size hail fell at the Olds-Didsbury airport at 0350Z (07/02).</p> <p>Max cell top: 12.1km, 62.4 max dBz, 61.6 max VIL</p> <p>Tmax YC = 23.9C and a trace of rain. Tmax QF = 21.5C and 0.4mm of rain. Tmax Radar = 22.0C and 10.9mm of rain.</p> | <p>Linden at 0520Z (07/02). HS3 stopped seeding and RTB at 0535Z (07/02). They landed at 0602Z (07/02).</p> <p>Flight Summary HS4: 0300Z-0447Z (07/02); 104 minutes wing-tip generators, 8 BIP; #1 Didsbury. HS3: 0308Z-0608Z (07/02); 247 EJ, 15 BIP; #1 Didsbury, #2 Olds, #1 Linden.</p> |
| <p>July 2, Saturday</p> | <p>The upper level jet was predicted to stay south of the area. A shortwave trough was positioned over BC in the morning and was expected to begin sliding over the foothills during the mid-afternoon. PVA forcing appeared to be relatively weak. 700mb (~10kft MSL) winds looked to be southwesterly and would easily push any convection along the foothills into the protected area. 850mb (~5kft MSL) and surface winds were expected to be out of the SE to E which would favor moisture pooling along the foothills. Area modified model soundings indicated the air mass in place over the region would be fairly unstable during the late afternoon. Bulk speed shear values were predicted to be around 15kts.</p> <p>Convection started developing along the southern foothills in the early afternoon. Storm #1 formed along the foothills west of Black Diamond and Turner Valley. This storm strengthened into a tornadic supercell as it slowly slid south-southeastward along the western border of the project area. Radar data indicated that this storm may have produced grape size hail west of Turner Valley and Higher River. During this same time convection formed along the foothills southwest of Cremona and west of Sundre. These thunderstorms moved eastward into the project area during the late afternoon hours. One of these storms (storm #2) developed south of Cremona and slowly moved eastward toward Airdrie and Crossfield. This storm slowly weakened in intensity as it approached these two cities. The last seed storm of the day (storm #3) formed west of Cremona at around 2330Z. This thunderstorm slowly grew taller as it moved eastward. The storm dissipated before it reached the cities of Crossfield and Airdrie. The convection then diminished across the whole region, and no significant weather occurred overnight.</p> <p>Pea size hail reported in Longview.</p> <p>Max cell top: 12.1km, 63.3 max dBz, 68.3 max VIL</p> <p>Tmax YC = 23.8C and no rain. Tmax QF = 23.8C and 4.6mm of rain. Tmax Radar = 21.4C and 0.5mm of rain.</p> | <p>HS2 was launched to growing convection along the foothills to the southwest of Calgary at 2006Z. They became airborne at 2030Z. At 2043Z HS2 started patrolling for Black Diamond. The crew then started seeding storm #1 for Black Diamond at 2052Z. The aircraft then stopped seeding and RTB at 2221Z. They landed at 2238Z.</p> <p>HS5 was launched at 2020Z to an intensifying storm west of Calgary. The flight was airborne at 2046Z. At 2100Z they climbed to the top seeding altitude and then headed to storm #1 west of Black Diamond. HS5 started seeding storm #1 for Black Diamond at 2114Z. They then stopped seeding at 2214Z and began patrolling the same area for the towns of Black Diamond and Turner Valley. At 2246Z HS5 stopped patrolling and RTB. They landed at 2258Z.</p> <p>HS1 was launched to a thunderstorm entering into the project area south of Cremona at 2125Z. The aircraft became airborne at 2146Z. HS1 started patrolling northwest of Airdrie at 2155Z. At 0004Z (07/03) HS1 started seeding storm #2 for Airdrie. They then stopped seeding and started patrolling for Airdrie at 0006Z (07/03). At 0019Z (07/03) the crew then stopped patrolling and RTB. They landed at 0030Z (07/03).</p> <p>HS4 was launched at 2131Z to a growing storm south of Cremona. They were airborne out of YQF at 2154Z. At 2210Z HS4 repositioned to a stronger TITAN cell west of Sundre. They were then redirected down to the northwest of Cochrane at 2222Z. At 2235Z the crew started patrolling for Cochrane. They stopped patrolling and RTB at 2245Z. The aircraft landed in EA3 at 2301Z.</p> <p>HS4 flew a reposition flight. The aircraft became airborne out of EA3 at 0028Z (07/03) and landed in YQF at 0041Z (07/03).</p> <p>HS2 was launched at 0149Z (07/03) to an intensifying storm heading toward Airdrie. The flight became airborne at 0200Z (07/03). At 0206Z (07/03) HS2 started seeding storm #3</p> |

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| | | <p>for Airdrie. The aircraft then stopped seeding and RTB at 0214Z (07/03). They landed at 0223Z (07/03).</p> <p>HS5 was launched to a growing thunderstorm moving toward Airdrie at 0149Z (07/03). They were airborne at 0202Z (07/03). The crew began patrolling for Airdrie at 0206Z (07/03). At 0214Z (07/03) HS5 stopped patrolling and RTB. They landed at 0221Z (07/03).</p> <p>Flight Summary HS2: 2014Z-2240Z; 180 minutes wing-tip generators, 4 BIP; #1 Black Diamond. HS5: 2035Z-2300Z; 87 EJ, 6 BIP; #1 Black Diamond. HS1: 2136Z (07/02)-0032Z (07/03); 17 EJ, 1 BIP; #2 Airdrie. HS4: 2146Z-2303Z; no seeding; patrol Airdrie; takeoff YQF, land EA3. HS4: 0025Z-0045Z (07/03); no seeding; reposition flight; takeoff EA3, land YQF. HS2: 0156Z-0225Z (07/03); 16 minutes wing-tip generators, 0 BIP; #3 Airdrie. HS5: 0158Z-0224Z (07/03); no seeding; patrol Airdrie.</p> |
| <p>July 3, Sunday</p> | <p>An upper level low was modeled to move east across central B.C., with mid-tropospheric temperatures cooling sharply through the forecast period. The upper level jet was projected to remain south of the project area. At the surface, a weak low was forecast to move east into Saskatchewan, dropping a cold front south across the project during peak heating. Downslope winds were predicted, creating a substantial moisture gradient from west to east. Severe instability was forecast, with shear sufficient for modest storm organization. Instability was predicted to wane through the evening with no significant weather after midnight.</p> <p>Activity began quickly Sunday, with convective rain showers moving off the foothills and intensifying into thunderstorms shortly after noon. This activity was patrolled near Sylvan and Cochrane, but no substantial hail threats developed until 20Z. At that time, a cluster of stronger convection formed between Sundre and Olds, with two cells, storm #1 northwest of Bowden and #2 west of Olds, showing supercellular characteristics. These storms were seeded until they passed the QE2. A third storm developed immediately northwest of High River at 2045Z. It was seeded (storm #3) for High River and Carseland, but was abandoned when more concerning convection developed near Cochrane. This Cochrane convection did not develop into a hail threat, however. At 2230Z, a new cluster of convection developed near Limestone Mountain. This convection gradually consolidated into a supercell, and moved right of the mean flow toward Sundre. It was seeded (storm #4) until it passed Sundre and weakened east of town. A fifth seeded storm developed northwest of Cochrane around 2330Z. This cell split at 0Z (07/04), with one part seeded as it moved southeast through northern Calgary and</p> | <p>HS3 was launched at 1838Z for thunderstorms developing near Innisfail. They were airborne at 1853Z. HS3 began to patrol Sylvan at 1905Z. HS3 RTB at 1921Z. They landed at 1930Z.</p> <p>HS1 was launched for developing convection north of Sundre at 1829Z. They were airborne at 1854Z. HS1 began to patrol Cochrane at 1905Z. HS1 began top seeding storm #2 Olds at 1957Z. They stopped seeding and repositioned to Turner Valley at 2058Z. HS1 RTB at 2107Z. They landed at 2126Z.</p> <p>HS4 was launched at 1843Z for thunderstorms near Sylvan. They were airborne at 1904Z. HS4 began base seeding storm #1 Bowden at 1956Z. HS4 RTB at 2048Z. They landed at 2056Z.</p> <p>HS2 was launched at 2002Z for convection between Sundre and Olds. They were airborne at 2018Z. HS2 began patrolling Strathmore at 2035Z. HS2 began base seeding storm #3 High River to Carseland at 2100Z. They stopped seeding and repositioned toward Black Diamond at 2115Z, but were redirected for new convection near Springbank 2129Z. HS2 began to patrol Cochrane-Turner Valley at 2152Z. HS2 RTB at 2159Z. They landed at 2209Z.</p> <p>HS4 was launched at 2233Z for strong convection west of Caroline. They were airborne at 2247Z. HS4 began base seeding</p> |

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| | <p>Chestermere, and a second area of new development was also seeded as it continued to develop on the western flank near Cochrane. The southeastward propagating cell intensified rapidly east of Calgary into a severe supercell, and was seeded (storm #5) as the storm approached Carseland until it exited the project area at 2Z (07/04). Additional elevated thunderstorms with little or no radar-indicated hail continued between 3-9Z (07/04) in the far southern project area, while a broad region of rain blanketed the northern project area. All activity subsided after 10Z (07/04).</p> <p>Tennis ball size hail was reported in Carseland. Greater than golf ball size hail reported in Langdon. 3.0cm size hail was observed at EA3. 3.0cm size hail was reported in Sundre. Dime size hail reported in NW Calgary. Pea size hail was reported in Cochrane.</p> <p>Max cell top: 10.6km, 64.2 max dBz, 69.9 max VIL</p> <p>Tmax YC = 24.3C and a trace of rain. Tmax QF = 22.0C and 3.6mm of rain. Tmax Radar = 22.7C and 3.0mm of rain.</p> | <p>storm #4 Sundre at 2302Z. They repositioned to Cochrane at 2350Z, seeding in transit. HS4 began seeding storm #5 Cochrane at 2358Z. They stopped seeding and RTB at 0042Z (07/04). HS4 landed at 0118Z (07/04).</p> <p>HS3 was launched at 2236Z for thunderstorms northwest of Sundre. They were airborne at 2251Z. HS3 started top seeding storm #4 Sundre at 2305Z. HS3 repositioned to new growth northwest of Cochrane at 2319Z. They began top seeding storm #5 Cochrane at 2330Z. HS3 stopped seeding and RTB at 0057Z (07/04). They landed at 0118Z (07/04).</p> <p>HS2 was launched at 2239Z for thunderstorms along the western buffer around Sundre. They were airborne at 2254Z. HS2 started base seeding storm #4 Sundre at 2311Z. HS2 stopped seeding and repositioned south of Cochrane at 0016Z (07/04). They began seeding storm #5 Cochrane at 0020Z (07/04). HS2 stopped seeding and RTB at 0039Z (07/04). They landed at 0044Z (07/04).</p> <p>HS5 was launched at 2311Z for developing convection northwest of Cochrane. They were airborne at 2329Z. HS5 began base seeding storm #5 Cochrane at 2337Z. They stopped seeding and repositioned east of Calgary at 0119Z (07/04). HS5 began base seeding storm #5 Chestermere at 0133Z (07/04). HS5 stopped seeding and RTB at 0158Z (07/04). They landed at 0209Z (07/04).</p> <p>HS1 was launched at 0012 (07/04) to stay clear of convection developing near Springbank. They were airborne at 0030Z (07/04). HS1 began to patrol Turner Valley at 0046Z (07/04). HS1 began top seeding storm #5 Calgary at 0057Z (07/04). HS1 stopped seeding and RTB at 0140Z (07/04). They landed at 0153Z (07/04).</p> <p>Flight Summary HS3: 1845Z-1935Z; no seeding; patrol Sylvan. HS1: 1847Z-2128Z; 101 EJ, 11 BIP; #2 Carstairs, patrol Cochrane. HS4: 1856Z-2100Z; 104 min wing-tip generators, 3 BIP; #1 Bowden. HS2: 2011Z-2211Z; 30 min wing-tip generators, 1 BIP, #3 High River to Carseland. HS4: 2242Z (07/03)-0122Z (07/04); 200 min wing-tip generators, 16 BIP; #4 Sundre, #5 Cochrane. HS3: 2244Z (07/03)-0122Z (07/04); 290 EJ, 6 BIP; #4 Sundre, #5 Cochrane to Calgary. HS2: 2249Z (07/03)-0046Z (07/04); 156 min wing-tip generators, 11 BIP; #4 Sundre to Cremona, #5 Cochrane. HS5: 2320Z (07/03)-0211Z (07/04); 0 EJ, 27 BIP; #5 Cochrane, Chestermere to Carseland.</p> |
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| | | <p>HS1: 0023Z-0156Z (07/04); 119 EJ, 5 BIP; #5 Calgary to Chestermere.</p> |
| <p>July 4, Monday</p> | <p>A deep upper level low was observed over far eastern B.C., and was expected to drift slowly south through the period. No organized synoptic forcing mechanisms were anticipated in the project area. Insolation was projected to foster significant diurnal instability, with broad areas of air-mass thunderstorms forecast across the project area. Gradually stabilizing conditions were expected overnight.</p> <p>Air-mass thunderstorms developed shortly before noon Monday in several clusters near Red Deer, Didsbury, and Springbank. The activity near Springbank began to intensify around 1830Z, and was seeded as it slowly drifted east into Calgary (storm #1). This disorganized convection did produce pea size hail in Calgary, but dissipated over the city around 1915Z and melded with a broken line of convection from Calgary to Pine Lake. Attention then turned to new convection developing over Cochrane. This activity was seeded (storm #2) as it drifted northeast toward Airdrie, until it also dissipated. Thunderstorms continued to develop through mid-afternoon, and a new cluster of convection southwest of Calgary at 22Z instigated patrol in this region. No substantial hail threats materialized, however, and resources were shifted to stronger thunderstorms that began to form a line between Cochrane and Caroline. This line was seeded (storm #3) as it approached several project cities, including Cochrane, Caroline, and Eckville, but was abandoned after 0Z (07/05) when it weakened considerably and no longer posed a hail risk. Rain showers continued behind this line until 5Z (07/05), followed by clearing skies across the region.</p> <p>Pea size hail reported in Calgary. Pea size hail reported in Red Deer.</p> <p>Max cell top: 9.9km, 61.8 max dBz, 66.5 max VIL</p> <p>Tmax YC = 20.7C and 6.8mm of rain. Tmax QF = 18.3C and no rain. Tmax Radar = 18.9C and 2.5mm of rain.</p> | <p>HS2 was launched at 1837Z for convection developing west of Calgary. They were airborne at 1856Z. HS2 began base seeding storm #1 Calgary at 1859Z. HS2 stopped seeding and RTB at 1938Z. They landed at 1947Z.</p> <p>HS1 was launched at 1841Z for convection developing west of Calgary. They were airborne at 1902Z. HS1 began top seeding storm #1 Calgary at 1918Z. They stopped seeding but continued to patrol Calgary at 1940Z. HS1 repositioned to Cochrane at 1951Z. HS1 began seeding storm #2 Cochrane at 2000Z. HS1 stopped seeding and began to patrol Calgary at 2039Z. HS1 RTB at 2054Z. They landed at 2108Z.</p> <p>HS2 was relaunched for new growth southwest of Calgary at 2152Z. They were airborne at 2203Z. HS2 began to patrol Calgary at 2211Z. HS2 repositioned to Olds at 2232Z, but were redirected to Cremona at 2253Z. HS2 began seeding storm #3 Cremona at 2302Z. They stopped seeding and RTB at 0027Z (07/05), and landed at 0037Z (07/05).</p> <p>HS1 was relaunched at 2152Z for new growth southwest of Calgary. They were airborne at 2209Z. HS1 began to patrol Cochrane at 2220Z. They descended to base seeding altitude at 2307Z and shifted toward a growing line of convection between Cochrane and Sundre. HS1 began base seeding storm #3 Cochrane at 2313Z. HS1 stopped seeding and RTB at 0014Z (07/05). They landed at 0026Z (07/05).</p> <p>HS4 was launched at 2316Z for a line of thunderstorms extending north from Cochrane to near Rocky MH. They were airborne at 2333Z. HS4 began seeding storm #3 Eckville at 2346Z. They stopped seeding and RTB at 0002Z (07/05), and landed at 0013Z (07/05).</p> <p>Flight Summary HS2: 1849Z-1951Z; 78 min wing-tip generators, 0 BIP; #1 Calgary. HS1: 1852Z-2111Z; 55 EJ, 2 BIP; #1 Calgary, #2 Cochrane. HS2: 2158Z (07/04)-0040Z (07/05); 168 min wing-tip generators, 3 BIP; #3 Cremona to Calgary, patrol Calgary. HS1: 2202Z (07/04)-0029Z (07/05); 0 EJ, 12 BIP; #3 Cochrane. HS4: 2325Z (07/04)-0015Z (07/05); 17 min wing-tip generators, 0 BIP; #3 Eckville.</p> |
| <p>July 5,</p> | <p>An upper level low was modeled to drift toward the</p> | <p>No aircraft operations.</p> |

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| <p>Tuesday</p> | <p>southeast corner of British Columbia. The jet stream was expected to remain south of the project area. No synoptic trigger mechanisms were forecast. Substantial insolation was expected to allow surface temperatures to exceed the convective temperature, with widespread pulse thunderstorms forecast. Activity was anticipated to dissipate as surface heating faded Tuesday evening, with isolated showers overnight.</p> <p>Isolated weak showers began to develop near Sundre late Tuesday morning, followed by a broad cluster of convective showers between Rocky MH and Stettler shortly after noon. Additional pulse convection developed between Sundre and Cochrane by 20Z, with spontaneous pulse thundershowers developing across the project area the rest of the afternoon. No cells became radar-indicated hail threats, and all activity dissipated with the loss of surface heating Tuesday evening. Stable, quiet conditions were observed Tuesday night.</p> <p>Max cell top: 6.1km, 58.2 max dBz, 18.8 max VIL</p> <p>Tmax YC = 17.2C and 6.4mm of rain. Tmax QF = 19.1C and 3.2mm of rain. Tmax Radar = 17.8C and 8.4mm of rain.</p> | |
| <p>July 6, Wednesday</p> | <p>An upper level low was expected to rejoin the jet stream and track east over the Alberta-Montana border. No significant synoptic triggers were expected within the project area. Daytime heating, while initially stunted by clouds, was expected to breach the convective temperature once again by mid-afternoon. Shear was forecast to remain poor, and cell motion was predicted from northeast to northwest as the upper level low pivoted away from the area. Pulse thunderstorms were expected, though no hail threats were predicted given the low shear and thermodynamic profile.</p> <p>Broken mid-level clouds gave way to sunshine by noon Wednesday, quickly leading to spontaneous convective showers across the project area. Convection was slightly taller and stronger than Tuesday, with several cells becoming brief low-end hail threats before dissipating. One cell that developed immediately outside Red Deer produced pea size hail in town around 2345Z, and another cell north of Three Hills produced radar-indicated hail up to grape size just before 1Z (07/07). Convection subsided into scattered rain showers by 2Z (07/07), which continued in the northern project area through 10Z (07/07).</p> <p>Pea size hail reported in Red Deer.</p> <p>Max cell top: 7.6 km, 60.8 max dBz, 30.3 max VIL</p> <p>Tmax YC = 20.1C and 0.5mm of rain. Tmax QF = 21.0C and 11.8mm of rain. Tmax Radar = 19.6C and no rain.</p> | <p>No aircraft operations.</p> |
| <p>July 7, Thursday</p> | <p>A shortwave ridge was modeled to spread over the area, bringing dry mid-level air but only a weak cap. No synoptic convective triggers were anticipated through the</p> | <p>No aircraft operations.</p> |

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| | <p>day. Strong insolation was expected to allow temperatures to exceed the convective temperature yet again, with storms favoring the northern project area where moisture was deeper and the cap was weaker. Instability was forecast to wane after peak heating Thursday evening, with convective activity gradually dissipating.</p> <p>Clear skies gave way to weak foothills convection in the northwest project area early Thursday afternoon, followed by isolated rain showers from Caroline to Ponoka between 19-22Z. At 2220Z, a stronger cell developed west of Caroline, and slowly and erratically propagated eastward across the northern project area from Caroline, to Sylvan, to Red Deer, until dissipating in the east buffer at 0530Z (07/08). This cell produced the highest storm metrics for the day, but never became a radar-indicated hail threat. Quiet conditions persisted the rest of the night.</p> <p>Max cell top: 6.1km, 55.9 max dBz, 16.5 max VIL</p> <p>Tmax YC = 23.0C and no rain. Tmax QF = 22.1C and 1.4mm of rain. Tmax Radar = 20.7C and no rain.</p> | |
| <p>July 8, Friday</p> | <p>A deep upper level low was projected to drift east off the coast of Washington, while a jet streak in northern Washington weakened and remained southeast of the project area. No significant PVA or any synoptic trigger mechanism was expected. At the surface, a lee cyclone was observed northeast of Three Hills, creating a substantial moisture gradient across the project. Isolated thunderstorms capable of small hail were predicted in the north to northeast project area where moisture was much higher, while quiet conditions were anticipated where drier conditions persisted to the south.</p> <p>Quiet, comfortable conditions were in place Friday morning into early Friday afternoon. At 20Z, a convective cell developed just east of Rimbey, and began a slow propagation east and south, with storm strength pulsing widely with time. It had a spontaneous intensification and jumped south into Lacombe around 22Z, dropping up to 2cm hail in the city. The cell finally fully dissipated shortly after 23Z, followed by a lull in convective activity. New convection dropped into the northern buffer at 0130Z (07/09). This activity moved southeast almost entirely within the northern and eastern buffer regions, but produced the strongest radar metrics of the day. Radar indicated grape size hail twenty miles west of Stettler. This convection dissipated shortly after 4Z (07/09). Scattered showers and weak thunderstorms continued in the northwest buffer much of the night, but never posed a hail risk to the project area.</p> <p>Max cell top: 10.6km, 62.7 max dBz, 61.9 max VIL</p> <p>Up to 2.0cm hail reported in Lacombe.</p> <p>Tmax YC = 24.9C and no rain. Tmax QF = 24.3C and no rain. Tmax Radar = 23.9C and no rain.</p> | <p>No aircraft operations.</p> |

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| <p>July 9, Saturday</p> | <p>A shortwave trough was modeled to move across the project area Saturday afternoon, becoming cutoff from the flow and stalling in the northern project area overnight. Strong PVA was forecast to instigate convection across the project area, with instability sufficient for a substantial hail threat. Directional shear was expected to be strong, particularly in the low levels. However, speed shear was weak. Thunderstorms were predicted to spread from southwest to northeast early Saturday afternoon, with rain showers continuing in the northern project area overnight.</p> <p>Convective showers developed over the foothills in the southwest buffer Saturday morning, but tracked north-northwest and did not threaten the project. Convective activity spread east into the project shortly after noon, however, forming a northward moving line that threatened Sundre and Cochrane around 1930Z. The first seeded storm of the day was a discrete cell 30 nautical miles southeast of the line, immediately southeast of Calgary. The cell moved north along the east edge of town, and was seeded until it new stronger cells formed on the southern flank of the line and posed a stronger more immediate threat to Calgary. Storm #2 was a collection of convective cells developing along the southern flank of the line over Calgary. These cells were strong but very slow moving, producing pea size hail and localized flooding in northwest Calgary. This activity was seeded until it weakened and finally pushed across Calgary around 2330Z. A third cluster of thunderstorms developed southeast of Red Deer at the north flank of the convective line between 23Z and 0Z (07/10), but never intensified into a hail concern. A broad mass of rain showers continued behind the line in the central and northern project area between 0Z and 9Z, though this activity never posed a hail concern.</p> <p>Max cell top: 11.4km, 61.5 max dBz, 71.7 max VIL</p> <p>Toonie size hail 10km NE of Cochrane. Pea size hail in northwest Calgary. Localized flash flooding reported in northwest Calgary.</p> <p>Tmax YC = 21.7C and 7.2mm of rain. Tmax QF = 21.4C and 2.4mm of rain. Tmax Radar = 20.1C and 8.9mm of rain.</p> | <p>HS5 was launched at 1842Z for a cluster of thunderstorms west of Calgary. They were airborne at 1906Z. HS5 began to patrol Cochrane and Calgary at 1917Z. They repositioned toward new convection in Okotoks at 2044Z, and continued to patrol for Calgary. HS5 began top seeding storm #1 Calgary at 2112Z. HS5 repositioned to new growth in north Calgary at 2126Z, and began seeding storm #2 Calgary at 2129Z. HS5 stopped seeding and RTB to Red Deer at 2222Z. They landed in Red Deer at 2247Z.</p> <p>HS2 was launched at 2112Z for convection west of Airdrie. They were airborne at 2129Z. HS2 began base seeding storm #2 Calgary at 2134Z. HS2 stopped seeding and RTB at 2308Z. They landed at 2314Z.</p> <p>HS1 was launched at 2220Z for convection in northwest Calgary. They were airborne at 2224Z. HS1 began top seeding storm #2 Calgary at 2241Z. They stopped seeding and RTB at 2316Z. HS1 landed at 2332Z.</p> <p>HS3 was launched at 2303Z for new convection developing southeast of Red Deer. They were airborne at 2319Z. HS3 began to patrol Red Deer at 2324Z. They stopped patrolling and RTB at 2327Z. HS3 landed at 2336Z.</p> <p>HS5 flew a reposition flight. They were airborne from YQF at 0032Z (07/10) and landed in YBW at 0058Z (07/10).</p> <p>Flight Summary HS5: 1854Z-2250Z; 108 EJ, 14 BIP; #1 Calgary, #2 Calgary, patrol Cochrane to Calgary; takeoff YBW, land YQF. HS2: 2121Z-2319Z; 188 min wing-tip generators, 17 BIP; #2 Calgary. HS1: 2217Z-2334Z; 41 EJ, 7 BIP; #2 Calgary. HS3: 2309Z-2341Z; no seeding; patrol Red Deer. HS5: 0023Z (07/09)-0100Z (07/10); no seeding; reposition flight; takeoff YQF, land YBW.</p> |
| <p>July 10, Sunday</p> | <p>An upper level closed low was centered over Washington in the morning. This low was expected to quickly move eastward throughout the period and was forecasted to be positioned over the Montana starting in the evening. Due to the low, several lobes of PVA looked to slide over the area from the N and NE, although most of the forcing appeared to be insignificant. Low level, northeast moisture advection and wind flow were expected to persist throughout the day and night. A surface low was predicted to be in place over southern SK. The 21Z and 00Z (07/11) modified model soundings for CYQF and CYYC showed a moderately unstable troposphere with</p> | <p>No aircraft operations.</p> |

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| | <p>enough speed and directional shear for small hail.</p> <p>Isolated, light convective rain showers fell over the area during the early afternoon. Stronger convective cells then grew over the southern foothills. A few of these slow moving storms were able to slide into the southwestern quadrant of the project area in the late afternoon. These thunderstorms dissipated in the early evening. Radar data indicated pea size hail may have fallen northwest of Okotoks. A band of stratiform rain showers with embedded weak convection then slid southward across the region during the nighttime hours.</p> <p>Max cell top: 9.1km, 57.5 max dBz, 23.0 max VIL</p> <p>Tmax YC = 20.6C and a trace of rain. Tmax QF = 17.6C and 21.4mm of rain. Tmax Radar = 18.2C and 1.0mm of rain.</p> | |
| <p>July 11, Monday</p> | <p>The closed low at the upper levels was centered over Montana in the morning and was predicted to move into southern SK during the afternoon. Due to the presence of the low to the southeast of the area, PVA was expected to continue throughout most of the forecast period. Low level and surface winds looked to stay mostly northwesterly. Low ceilings and cloudy conditions were expected to persist for most of the day. Area modified model soundings indicated the atmosphere would be moderately unstable with 500 to 700J/kg of CAPE. No directional shear and only very weak speed shear were expected, so thunderstorms looked to be short-lived.</p> <p>Widespread stratiform rain showers fell during the morning. In the early afternoon convective cells formed over the northeast part of the region. Then in the late afternoon and early evening a line of pulse thunderstorms formed over the northern part of the project area and pushed southward across the entire region. The strongest convection of the afternoon occurred north of Three Hills and east of Red Deer in the eastern buffer zone. Radar data indicated grape size hail may have fallen east of Red Deer in the eastern buffer zone. In the late evening the convection dissipated across the protected area.</p> <p>Pea size hail reported at the Cross Iron Mills mall.</p> <p>Max cell top: 9.1km, 62.5 max dBz, 40.2 max VIL</p> <p>Tmax YC = 20.1C and 18.9mm of rain. Tmax QF = 19.6C and 8.0mm of rain. Tmax Radar = 19.4C and 4.6mm of rain.</p> | <p>HS2 flew a maintenance flight. The aircraft was airborne out of YBW at 1325Z and landed in YQF at 1357Z.</p> <p>HS2 then flew a return maintenance flight. The flight was airborne out of YQF at 2224Z and landed in YBW at 2252Z.</p> <p>Flight Summary HS2: 1315Z-1400Z; no seeding; maintenance flight; takeoff YBW, land YQF. HS2: 2213Z-2254Z; no seeding; maintenance flight; takeoff YQF, land YBW.</p> |
| <p>July 12, Tuesday</p> | <p>AB was forecasted to be in-between two large scale low pressure systems. One low pressure system was expected to be centered just off the coast of central BC and the other low looked to be positioned over southern MB. Lobes of PVA were predicted to pass over the region from the NE throughout the period. At the low levels, the wind flow was expected to be out of the north to northeast which would likely favor upslope conditions over the region. The surface wind flow also appeared to be similar to the low level wind flow. Elevated instability looked to</p> | <p>HS5 was launched at 2138Z to growing convective cells directly over Calgary. The flight became airborne at 2150Z. At 2204Z HS5 started top seeding storm #1 for Calgary. They then stopped seeding and repositioned to the Airdrie area at 2223Z. The storm moving toward Airdrie began to weaken as the aircraft approached this thunderstorm, so at 2228Z the crew repositioned to the Cochrane area. The aircraft began patrolling the Cochrane area at</p> |

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| | <p>remain in place over the region through the overnight hours. Modified model soundings for the region showed daytime instability anywhere from 500 to 1000J/kg of CAPE with mid-level directional shear.</p> <p>Convection started growing east of Red Deer during the late morning. Numerous pulse and short-lived thunderstorms formed over the entire region from the early afternoon through roughly the time of sunset. The first seeded storm (#1) of the day formed directly over Calgary and slowly slid southwestward. Radar data suggested grape size hail may have fallen over southern Calgary. This particular thunderstorm was short-lived. The second seeded storm (#2) of the day formed south of Red Deer and tracked southwestward toward Innisfail. This storm was short-lived and dissipated before reaching Innisfail. Scattered convective rain showers and a few isolated short-lived thunderstorms were then observed during the nighttime hours.</p> <p>Drifts of pea and nickel size hail reported in Calgary. Areas of flooding reported in Calgary. Pea size hail fell at the Olds-Didsbury airport.</p> <p>Max cell top: 10.6km, 62.1 max dBz, 50.5 max VIL</p> <p>Tmax YC = 21.5C and 2.6mm of rain. Tmax QF = 21.8C and 0.4mm of rain. Tmax Radar = 20.8C and 21.3mm of rain.</p> | <p>2231Z. HS5 then was redirected at 2239Z to new growth over the eastern part of Calgary. At 2247Z the aircraft started patrolling Calgary. HS5 next repositioned back to the Cochrane area at 2248Z, and they started patrolling for Cochrane at 2252Z. They were then redirected to the Innisfail area at 2305Z. HS5 started top seeding storm #2 for Innisfail at 2320Z. They stopped seeding at 2332Z and RTB. The aircraft landed at 2349Z.</p> <p>HS4 flew a maintenance flight. The flight was airborne at 2354Z and landed at 0012Z (07/13).</p> <p>Flight Summary HS5: 2144Z-2352Z; 25 EJ, 5 BIP; #1 Calgary, patrol Airdrie, patrol Cochrane, #2 Innisfail. HS4: 2342Z (07/12)-0018Z (07/13); no seeding; maintenance flight.</p> |
| <p>July 13, Wednesday</p> | <p>The closed low just off the coast of central BC was expected to begin gradually moving southeastward and looked to be positioned over Vancouver Island by the overnight hours. Several lobes of PVA were expected to slide eastward across the area throughout the period. Overnight, a shortwave trough was forecasted to slide eastward along the international border. Low level winds looked to be out of the NW to N, and surface winds were expected to be out of the N to NE which would favor upslope conditions. The modified model soundings indicated the region's air mass would have the most potential for thunderstorms during the early afternoon. Conditions were then expected to slowly stabilize starting in late afternoon.</p> <p>Numerous short-lived thunderstorms formed over the region from the early morning through around the time of sunset. Radar data suggested a small area northeast of Lacombe may have seen grape size hail. During the nighttime hours the convection became weaker but more widespread. These convective rain showers were mainly concentrated near and along the foothills.</p> <p>Max cell top: 7.6km, 61.2 max dBz, 31.6 max VIL</p> <p>Tmax YC = 19.2C and 6.2mm of rain. Tmax QF = 18.0C and 4.2mm of rain. Tmax Radar = 17.3C and 15.5mm of rain.</p> | <p>No aircraft operations.</p> |
| <p>July 14, Thursday</p> | <p>A closed upper level low pressure system was positioned over the northern part of Vancouver Island during the morning hours. This low was expected to slowly move</p> | <p>No aircraft operations.</p> |

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| | <p>eastward and was predicted to be centered over south central BC by the evening hours. A wave of PVA appeared to slide northeastward across the region during the afternoon hours. 700mb (~10kft) winds looked to switch to more of a southerly direction during the afternoon, whereas below this level winds were forecasted to be easterly which would favor upslope conditions. Area modified model soundings indicated a moderately unstable troposphere (CAPE 700 to 900J/kg) with directional shear and weak speed shear.</p> <p>Scattered convective rain showers fell near the foothills in the early morning. Thunderstorms then grew over the northern part of the project area during the late morning, afternoon, and evening hours. These storms were short-lived and mostly produced rain showers. Radar data suggested grape size hail may have fallen to the southeast of Red Deer. In the evening thunderstorms initiated along the foothills. These weak and short-lived storms drifted slowly into the project area producing rain showers. Overnight, widespread stratiform and convective rain showers fell over most of the region.</p> <p>Max cell top: 7.6km, 61.0 max dBz, 35.2 max VIL</p> <p>Tmax YC = 19.7C and 17.2mm of rain. Tmax QF = 20.1C and 3.8mm of data. Tmax Radar = 18.6C and 2.0mm of rain.</p> | |
| <p>July 15, Friday</p> | <p>The mid and upper level closed low was centered along the BC and Washington border during the morning hours. This low was forecasted to slowly slide eastward throughout the forecast period, and the low appeared to be positioned over southeastern BC late in the period. Due to the low, PVA looked to be abundant throughout the day and night. Low level and surface winds were expected to be mainly easterly which would favor upslope weather conditions. The modified model soundings for the region showed the best potential for moderately strong thunderstorms would be over the southern half of the project area. 0 to 6km bulk speed shear values were predicted to be around 10 to 15kts.</p> <p>In the late morning a precipitation shield formed over the southern foothills and mountains. This large band of precipitation with embedded thunderstorms gradually moved northeastward across the entire area through the afternoon hours. Radar data suggested pea size hail may have fallen near Turner Valley and Black Diamond. Starting around 2130Z the next wave of convection moved northward into the southern part of the region. This band of precipitation and embedded thunderstorms continued to move northward across the protected area into the early evening hours. Stratiform rain showers then fell over the northern part of the region during the nighttime hours.</p> <p>Pea size hail was reported in Turner Valley and near Okotoks.</p> <p>Max cell top: 8.4km, 57.6 max dBz, 26.5 max VIL</p> | <p>HS1 was launched to a tall storm moving northward toward High River at 2137Z. The aircraft became airborne at 2158Z. They started patrolling the Turner Valley and Black Diamond area at 2204Z. At 2228Z HS1 stopped patrolling and RTB. The flight landed at 2243Z.</p> <p>Flight Summary HS1: 2149Z-2244Z; no seeding; patrol Turner Valley and Black Diamond.</p> |

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| | <p>Tmax YC = 13.9C and 37.9mm of rain. Tmax QF = 19.3C and 15.2mm of rain. Tmax Radar = 15.6C and 23.1mm of rain.</p> | |
| <p>July 16, Saturday</p> | <p>The upper level low was positioned over the far SE part of BC during the morning hours. This low was expected to weaken throughout the period as it slowly tracked eastward along the international border toward southern AB. PVA looked to occur throughout the period, although weaker PVA was forecasted to occur starting in the evening as the low began to fill over southern AB. At the low levels and surface, a low was predicted to be centered just to the east of the area during the afternoon. The 00Z (07/17) modified model soundings for CYYC and CYQF indicated CAPE values on the order of 300 to 600J/kg could be expected during the time of peak heating. The 0 to 6km bulk speed shear values looked to be relatively weak, so short-lived thunderstorms were expected.</p> <p>Stratiform rain showers fell over the region during the morning. Scattered, low-top thunderstorms then pushed southwestward across the region during the afternoon and evening. Radar data suggested pea size hail may have fell on to a small land area just north of the town of Caroline. Overnight, scattered convective rains showers were observed over parts of the protected area.</p> <p>Max cell top: 7.6km, 59.2 max dBz, 20.3 max VIL</p> <p>Tmax YC = 17.5C and no rain. Tmax QF = 20.3C and 0.4mm of rain. Tmax Radar = 17.6C and no rain.</p> | <p>No aircraft operations.</p> |
| <p>July 17, Sunday</p> | <p>A broad upper level high pressure system in northern Alberta was projected to weaken, while a trough off the coast of Washington spread northeastward. Atypical easterly flow was observed in the mid and upper levels, but was expected to pivot to the southwest overnight. Weak PVA was modeled to drift north across the project area in the afternoon, while strong insolation destabilized the environment. Instability was forecast to diminish overnight, with clear skies by dawn Monday.</p> <p>Scattered rain showers Sunday morning gradually spread and intensified into Sunday afternoon. Activity coalesced into two bands of thunderstorms by 21Z, with a northern band stretching from Caroline to Three Hills, and a southern band from Kananaskis Village through Okotoks to Mossleigh. Radar indicated brief pulses of small hail with this activity, including pea size hail in Red Deer, and grape size hail between Okotoks and Calgary. No mesocyclone circulations were detected with these thunderstorms, though a landspout tornado was reported 10km NE of Okotoks. Convection continued to spread west across the central project area into Sunday evening, weakening into rain showers by 1Z (07/18). All activity dissipated or departed by midnight, with clearing skies into Monday morning.</p> <p>Max cell top: 7.6km, 62.1 max dBz, 33.7 max VIL</p> | <p>HS2 flew a maintenance flight. They were airborne at 1753Z and landed at 1805Z.</p> <p>Flight Summary HS2: 1744Z-1807Z; no seeding; maintenance flight.</p> |

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| | <p>Environment Canada confirmed an EF-0 landspout tornado 10km NE of Okotoks.</p> <p>Tmax YC = 19.6C and 11.6mm of rain. Tmax QF = 20.2C and 9.4mm of rain. Tmax Radar = 19.0C and no rain.</p> | |
| <p>July 18, Monday</p> | <p>An upper level jet streak was modeled to edge northward into far southern Alberta, with the left exit region in the southern project area. Vorticity associated with a weak shortwave trough was expected to advect into the region Monday evening. Surface flow was observed to be predominately southerly, though local upslope flow was forecast. A stout cap was projected to stymie convection in the early afternoon, but was forecast to break by peak heating. Severe instability and shear were predicted, producing dangerous supercells with large hail and potential tornados. Convection was expected to subside and depart the area by midnight.</p> <p>Towering cumulus over the foothills evolved into isolated thunderstorms early Monday afternoon. Storms initially struggled to survive away departed the foothills, but one cell's proximity to Cochrane warranted patrol around 2030Z. This cell continued to develop on its southwestern flank, barely penetrating the western project border, until a new more intense period of intensification warranted seeding just before 22Z. The cell, storm #1, drifted northeast maintaining its intensity between Cochrane and YBW, but ultimately dissipating before passing north of Calgary. Meanwhile, further north, a convective cell began developing east of the foothills, immediately southwest of Rocky MH. The storm moved erratically and intensified rapidly, glancing Rocky MH to the north, before turning right of the mean flow and tracking toward Sylvan. It was patrolled and seeded (storm #2), before it suddenly stalled and dissipated ten miles west of Eckville. The third seeded storm of the day originated in far southeastern British Columbia early Monday afternoon, and raced north-northeast toward the project area. It was seeded as it entered the southern buffer and moved quickly across Calgary, only to dissipate immediately northeast of town. Additional thunderstorms associated with the fast-moving convection moved across the southeastern buffer between 2-3Z, while a new thunderstorm developed on the foothills southwest of Rocky MH. The latter cell produced the largest radar-indicated hail of the day on the western edge of the project area, but gradually weakened as it drifted east into the project area south of Rocky MH. The cell dissipated shortly after dusk, and no significant weather occurred the remainder of the night.</p> <p>Golf ball size hail reported near Rocky MH. Up to Loonie size hail reported in Calgary.</p> <p>Max cell top: 11.4km, 63.1 max dBz, 73.2 max VIL</p> <p>Tmax YC = 23.3C and 5.2mm of rain. Tmax QF = 22.9C and no rain. Tmax Radar = 21.7C and no rain.</p> | <p>HS5 was launched at 2011Z for a strong cell southwest of Cochrane. They were airborne at 2030Z. HS5 began to patrol Calgary at 2038Z. They began seeding storm #1 Calgary at 2153Z. HS5 stopped seeding and RTB at 2305Z. They landed at 2315Z.</p> <p>HS2 was launched at 2154Z for a strong thunderstorm southwest of Cochrane approaching the western project boundary. They were airborne at 2208Z. HS2 began seeding storm #1 Calgary at 2212Z. HS2 stopped seeding and RTB at 2322Z. They landed at 2329Z.</p> <p>HS1 was launched at 2154Z for convection near Sundre. They were airborne at 2218Z. HS1 began base seeding storm #1 Calgary at 2230Z. HS1 stopped seeding and climbed to top seeding altitude at 2307Z. They began to patrol Calgary at 2319Z. HS1 repositioned to new convection near High River at 2356Z. They began top seeding storm #3 High River at 0009Z (07/19). HS1 stopped seeding and RTB at 0142Z (07/19), and landed at 0156Z (07/19).</p> <p>HS4 was launched at 2249Z for a supercell east of Rocky MH. They were airborne at 2305Z. HS4 began base seeding storm #2 Eckville at 2322Z. HS4 stopped seeding and RTB at 2336Z. They landed at 2352Z.</p> <p>HS3 was launched at 2249Z for a supercell east of Rocky MH. They were airborne at 2313Z. HS3 began patrolling Eckville at 2326Z. HS3 RTB at 2331Z. They landed at 2343Z.</p> <p>HS2 was relaunched at 0019Z (07/19) for thunderstorms moving north into the project near High River. They were airborne at 0034Z (07/19). HS2 began seeding storm #3 Calgary at 0039Z (07/19). HS2 stopped seeding and RTB at 0200Z (07/19). They landed at 0210Z (07/19).</p> <p>HS5 was relaunched at 0033Z (07/19) for strong convection west of High River. They were airborne at 0045Z (07/19). HS5 began base seeding storm #3 Calgary at 0052Z (07/19). They stopped seeding and RTB at 0145Z (07/19). HS5 landed at 0158Z (07/19).</p> <p>Flight Summary HS5: 2022Z-2317Z; 91 EJ, 7 BIP; #1 Calgary. HS2: 2200Z-2332Z; 140 min wing-tip</p> |

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| | | <p>generators; 0 BIP; #1 Calgary. HS1: 2209Z (07/18)-0158Z (07/19); 186 EJ, 21 BIP; #1 Calgary, #3 High River to Calgary. HS4: 2255Z-2355Z; 28 min wing-tip generators; 0 BIP; #2 Eckville. HS3: 2258Z-2348Z; no seeding; patrol Eckville. HS2: 0027Z-0213Z (07/19); 162 min wing-tip generators, 15 BIP; #3 Calgary. HS5: 0037Z-0200Z (07/19); 0 EJ, 13 BIP; #3 Calgary.</p> |
| <p>July 19, Tuesday</p> | <p>A positively tilted upper level trough axis was forecast to bisect the far northern project area throughout the forecast period. No significant PVA was anticipated. Downslope surface air created a substantial moisture gradient from southwest to northeast Tuesday morning, a feature expected to persist through the day. Strong insolation was predicted to break a weak cap Tuesday afternoon, with air-mass thunderstorms intensifying as they moved east into deeper moisture. Modest storm organization was forecast, with strong speed shear but negligible directional shear. Instability was expected to wane after peak heating, with clear skies overnight.</p> <p>Weak convective showers developed across the northern half of the project area between 17-21Z. By 22Z, pulse thunderstorms began to form with this activity, with one cell producing radar indicated pea size hail north of Sundre. Activity within the project area subsided around 1Z (07/20), though scattered showers or virga continued in the northern buffer through much of the night.</p> <p>Max cell top: 8.4km, 57.6 max dBz, 24.3 max VIL</p> <p>Tmax YC = 25.8C and no rain. Tmax QF = 24.7C and no rain. Tmax Radar = 25.1C and no rain.</p> | <p>No aircraft operations.</p> |
| <p>July 20, Wednesday</p> | <p>An upper level trough axis was modeled to remain over the project area, while a jet streak in northern Montana moved away from the region. No significant synoptic trigger mechanisms were expected. Moisture was observed to be relatively low across the project area, with dry downslope air predicted to persist through the day. A small threat of convective showers was forecast in the northeast project area during peak heating, given the higher moisture expected there. Conditions were expected to stabilize further overnight, with clearing skies.</p> <p>Clear skies gave way to boundary layer cumulus in the northern project area Wednesday afternoon. Weak convective showers began to develop from Sundre north to the buffer after 21Z, with an unexpectedly strong storm forming immediately west of Red Deer around 1Z (07/21). This cell produced lightning and pulsed in intensity as it tracked east across the city and into the eastern buffer, and produced radar-indicated pea size hail near the outer edge of the eastern buffer before departing. Generally clear skies then prevailed for much of the night, though weak showers or virga did develop in the northern project after 8Z (07/22).</p> | <p>No aircraft operations.</p> |

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| | <p>Max cell top: 7.6km, 56.7 max dBz, 23.8 max VIL</p> <p>Tmax YC = 25.8C and no rain. Tmax QF = 24.6C and no rain. Tmax Radar = 23.1C and no rain.</p> | |
| July 21, Thursday | <p>A broad upper level jet was projected to lie across the southern project area throughout the period. A weak area of vorticity was modeled to pass east over the central project area in the early afternoon. Downslope flow was forecast to continue through the day, creating a sharp moisture gradient from southwest to northeast. Insolation was projected to be sufficient for air-mass thunderstorms in the north and east, where instability was stronger. Substantial speed shear was anticipated, with a small threat that any mature convection could become supercellular. All activity was forecast to subside after dusk, with no significant weather after midnight.</p> <p>Quiet, mostly clear conditions prevailed across the project area Thursday morning and throughout the afternoon. Weak echoes began to develop shortly after 0Z (07/22), however, intensifying into isolated thundershowers in the northern project and buffer until 6Z. Lightning was observed with this activity, but hail was neither reported nor indicated by radar. Tranquil conditions then resumed for the remainder of the night.</p> <p>Max cell top: 6.1km, 54.4 max dBz, 12.6 max VIL</p> <p>Tmax YC = 27.4C and no rain. Tmax QF = 25.1C and no rain. Tmax Radar = 24.2C and no rain.</p> | No aircraft operations. |
| July 22, Friday | <p>A strong shortwave trough was projected to slide east across southern Alberta. Pulses of PVA were modeled to accompany this feature, instigating convection across the project area. At the surface, a lee low was predicted to move east in far southern Alberta, helping turn surface winds upslope in the southern project area. Strong instability and significant wind shear were forecast, fostering an appreciable hail threat in the project, though the best intersection of instability, shear, and forcing was predicted to remain south of the project area. Considerable elevated instability was forecast to persist overnight, with a second wave of convection anticipated.</p> <p>Calm conditions Friday morning gave way to increasing clouds and weak showers across the southern project area early Friday afternoon. Convection began to initiate along the foothills between Sundre at Cochrane around 2030Z, with one cell, storm #1, growing explosively as it entered the western project area. This cell moved left of the mean flow, and was seeded as it moved northeast near Cremona. It weakened considerably just before 22Z, however, and dissipated without hitting a project city. Clouds and weak showers continued across the southern half of the project Friday afternoon, with quick bursts of stronger convection along the foothills weakening upon entering the project area. No hail threats were detected the remainder of the day, until a second wave of convection began to approach the project from the</p> | <p>HS5 was launched at 2049Z for convection firing along the foothills. They were airborne at 2105Z. They began to patrol west of Calgary at 2105Z. HS5 RTB at 2231Z. They landed at 2239Z.</p> <p>HS2 was launched at 2051Z for convection firing along the foothills. They were airborne at 2114Z. HS2 began base seeding storm #1 Cremona at 2126Z. HS2 stopped seeding and began to patrol Cremona at 2156Z. HS2 RTB at 2222Z. They landed at 2236Z.</p> <p>HS5 was launched at 0706Z (07/23) for a line of thunderstorms sweeping SE across the project area. They were airborne at 0726Z (07/23). HS5 began top seeding storm #2 Calgary at 0735Z (07/23). They stopped seeding and RTB at 0828Z (07/23), and landed at 0839Z (07/23).</p> <p>Flight Summary HS5: 2058Z-2240Z; no seeding; patrol Calgary. HS2: 2105Z-2239Z; 60 min wing-tip generators, 0 BIP; #1 Cremona. HS5: 0718Z-0841Z (07/23); 54 EJ, 8 BIP; #2 Calgary.</p> |

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| | <p>northwest at 4Z (07/23). This convection grew into a line of strong elevated thunderstorms, and accelerated southeast across the much of the project area between 4Z and 10Z. One storm on the southern flank of the line intensified into a hail threat for Calgary, and was seeded (storm #2) until it moved across the city and dissipated around 0830Z. Stratiform rain showers persisted behind the line in the northern project area, eventually departing around dawn Saturday.</p> <p>Max cell top: 11.4km, 60.1 max dBz, 45.1max VIL</p> <p>Pea to marble size hail was reported in northern Calgary. 0.3cm hail was reported at YQF.</p> <p>Tmax YC = 22.6C and 4.0mm of rain. Tmax QF = 25.2C and 10.0mm of rain. Tmax Radar = 23.1C and no rain.</p> | |
| <p>July 23, Saturday</p> | <p>The project area lay between two upper level disturbances – one exiting the region in Manitoba, and another approaching the area in central B.C. No significant convective triggers were expected. Light northwesterly surface flow was forecast Saturday afternoon, advecting cooler and slightly drier air into the region. Strong insolation under clear skies was predicted to foster air-mass convection, but weak shear and limited instability were predicted to keep thundershowers weak and beneath hail-concerning criteria. Quickly stabilizing conditions and clearing skies were anticipated after dusk.</p> <p>Isolated convection began developing in the western project area shortly after noon, and spread east throughout the afternoon. Most convection remained weak, with rain and some lightning, but a few cells became low-end hail threats, producing radar-indicated pea size hail. The strongest radar indicated storm formed with the initial round of convective activity after noon, and continued as a disorganized cluster of convection as it moved east-southeast from the foothills west of Caroline to the buffer east of Irricana. A second cluster of convection formed near Caroline around 0030Z (07/24), and spread southeast affecting an area from Innisfail to Didsbury through the evening. No radar indicated hail threats affected a project city. All activity weakened and departed after 4Z, with clear skies overnight.</p> <p>Max cell top: 9.1km, 59.8 max dBz, 29.3 max VIL</p> <p>Tmax YC = 24.2C and 0.8mm of rain. Tmax QF = 22.7C and no rain. Tmax Radar = 21.8C and 3.3mm of rain.</p> | <p>No aircraft operations.</p> |
| <p>July 24, Sunday</p> | <p>The upper level jet stream was predicted to be centered over the northern part of AB. The southern half of AB appeared to see zonal flow throughout the period as a shortwave trough pushed eastward across northern AB. PVA was expected to be negligible throughout most of the forecast period. Low level and surface winds looked to be out of the SW to S favoring downslope weather conditions. Later in the evening into the early nighttime hours a cold front was forecasted to slide southeastward</p> | <p>No aircraft operations.</p> |

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| | <p>across the area. Modified model soundings for CYQF showed a moderately unstable air mass in place over the northern part of the area from the late afternoon through the early nighttime hours. A moderately strong cap was expected to be in place through at least the early evening hours.</p> <p>Fair weather cumulus, altocumulus, and cirrus clouds were observed over the entire region during the afternoon and evening. In the evening isolated convection developed in the northern buffer zone as a cold front began to push southeastward across the area. Radar data suggested pea size hail may have fallen to the northwest of Rimbey in the northern buffer zone from one of these thunderstorms. During the early nighttime hours isolated convective rain showers fell over the northern half of the region as the cold front continued to push southeastward across the area.</p> <p>Max cell top: 7.6km, 59.6 max dBz, 29.9 max VIL</p> <p>Tmax YC = 25.5C and no rain. Tmax QF = 25.6C and no rain. Tmax Radar = 24.7C and no rain.</p> | |
| <p>July 25, Monday</p> | <p>The upper level wind speeds were expected to decrease over central AB as the broad jet streak moved eastward into MB. Several lobes of moderately strong PVA looked to move eastward across the region from the late afternoon through the nighttime hours. Warm moist air (i.e. 850mb theta-e ridging) was forecasted to be in place over the area throughout the forecast period. Low level and surface winds appeared to stay out of the SE through at least midnight local time. The air mass was predicted to contain the most instability near and along the foothills. This axis of higher instability was then expected to begin shifting eastward during the nighttime hours. 0 to 6km bulk speed shear values looked to be marginal, around 15kts.</p> <p>Thunderstorms began to move off the foothills during the mid-afternoon. Storm #1 initiated over the mountains west of Cremona. This thunderstorm intensified as it tracked southeastward through Cochrane and Calgary. Radar data showed grape size hail may have fallen to the northwest of Cochrane. At this same time, a cluster of convection developed over the mountains west of Sundre and southwest of Calgary. These convective rain showers quickly pushed eastward into the project area during the late afternoon hours. In the early evening explosive growth occurred over the foothills west of Turner Valley and Black Diamond. This tall storm (#2) then slid southeast toward High River. Starting around 0100Z (07/26) another long-lived storm began to move closer to the western project area border to the northwest of Rocky MH. This storm hugged to foothills as it moved south-southeastward along the western border of the protected area before eventually moving toward the Rocky MH area. This thunderstorm dissipated just before reaching the town of Rocky MH. During the early nighttime hours the convection moved eastward over the area and eventually shifted east of the region during the late</p> | <p>HS1 was launched at 2140Z to a strengthening storm northwest of Calgary. They became airborne at 2202Z and started patrolling Cochrane at 2207Z. HS1 started top seeding storm #1 for Cochrane at 2218Z. The flight then stopped seeding at 2318Z and RTB. They landed at 2330Z.</p> <p>HS2 was launched to a growing storm moving toward Cochrane at 2209Z. The flight was airborne at 2223Z. They started seeding storm #1 for Cochrane at 2234Z. At 2355Z HS2 stopped seeding and RTB. The flight landed at 0000Z (07/26).</p> <p>HS4 flew a maintenance flight. They were airborne out of YQF at 2231Z and landed in EA3 at 2249Z.</p> <p>HS3 was launched at 2240Z to a long-lived storm approaching Calgary. The aircraft was airborne at 2313Z. HS3 began patrolling near Didsbury at 2328Z. At 0020Z (07/26) they repositioned to a strengthening storm west of Turner Valley and Black Diamond. The crew then started top seeding storm #2 for High River at 0048Z (07/26). At 0130Z (07/26) HS3 stopped seeding and RTB. They landed at 0204Z (07/26).</p> <p>HS4 was launched at 0030Z (07/26) to a tall storm intensifying west of Turner Valley and Black Diamond. They were airborne out of EA3 at 0041Z (07/26). HS4 began patrolling the Cochrane area starting at 0100Z (07/26). Then at 0113Z (07/26) the flight was redirected to the Rocky MH area. At 0120Z (07/26) HS4</p> |

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| | <p>overnight hours.</p> <p>Max cell top: 10.6km, 61.7 max dBz, 55.8 max VIL</p> <p>Tmax YC = 24.7C and 8.4mm of rain. Tmax QF = 23.0C and 3.2mm of rain. Tmax Radar = 21.9C and 0.5mm of rain.</p> | <p>RTB and landed in YQF at 0137Z (07/26).</p> <p>HS4 was launched to a storm northwest of Rocky MH at 0233Z (07/26). The flight became airborne at 0253Z (07/26). HS4 began patrolling Rocky MH at 0311Z (07/26). They stopped patrolling and RTB at 0323Z (07/26). HS4 landed at 0340Z (07/26).</p> <p>Flight Summary HS1: 2148Z-2332Z; 29 EJ, 9 BIP; patrol Cochrane; #1 Calgary. HS2: 2217Z (07/25)-0002Z (07/26); 162 minutes wing-tip generators, 8 BIP; #1 Calgary. HS4: 2220Z-2306Z; no seeding; maintenance flight; takeoff YQF, land EA3. HS3: 2250Z (07/25)-0208Z (07/26); 153 EJ, 7 BIP; patrol Didsbury; #2 High River. HS4: 0035Z-0140Z (07/26); no seeding; patrol Cochrane; takeoff EA3, land YQF. HS4: 0247Z-0342Z (07/26); no seeding; patrol Rocky MH.</p> |
| <p>July 26, Tuesday</p> | <p>A flat ridge of high pressure was forecasted to be centered along the BC/AB border. This ridge appeared to be insignificant in terms of inhibiting deep convection. A small lobe of PVA, associated with a very slow moving shortwave trough, was expected to slide eastward across the southern part of the region during the afternoon. The easterly low level and surface wind flow looked to favor upslope conditions. The primary triggers were predicted to be elevated surface heating along the foothills and PVA over southern AB. Modified model soundings for area are showed a very unstable air mass in place across the area. 0 to 6km and buoyancy layer effective bulk shear values were expected to be weak.</p> <p>Thunderstorms started forming along the foothills and directly over the project area during the early afternoon. These thunderstorms were initially short-lived and did not threaten any populated areas. In the late afternoon storm #1 formed to the southwest of Calgary. This storm was nearly stationary and gradually dissipated. Storm #1 also mostly stayed to the southwest of Calgary. Radar data suggested grape size hail may have fallen from this same storm. Thunderstorms continued to form along the western border of the project area into the evening hours. During the nighttime hours the convective activity diminished over the area.</p> <p>Max cell top: 11.4km, 62.7 max dBz, 67.2 max VIL</p> <p>Tmax YC = 25.1C and 0.2mm of rain. Tmax QF = 25.1C and no rain. Tmax Radar = 24.4C and no rain.</p> | <p>HS2 was launched at 2257Z to a quickly growing cell southwest of Calgary. The aircraft became airborne at 2310Z. At 2317Z HS2 started seeding storm #1 for Calgary. They then stopped seeding and RTB at 0004Z (07/27). The flight landed at 0012Z (07/27).</p> <p>HS5 was launched to a growing thunderstorm southwest of Calgary at 2257Z. The flight was airborne at 2313Z. They started top seeding storm #1 for Calgary at 2325Z. At 0019Z (07/27) HS5 stopped seeding and started patrolling the same area for Calgary. They landed at 0026Z (07/27).</p> <p>HS4 was launched at 2308Z to an intensifying storm to the southwest of Calgary. They became airborne at 2323Z. At 2356Z HS4 started seeding storm #1 for Calgary. The crew then stopped seeding and RTB at 0010Z (07/27). The aircraft landed at 0039Z (07/27).</p> <p>Flight Summary HS2: 2304Z (07/26)-0018Z (07/27); 94 minutes wing-tip generators, 6 BIP; #1 Calgary. HS5: 2307Z (07/26)-0028Z (07/27); 78 EJ, 4 BIP; #1 Calgary. HS4: 2317Z (07/26)-0043Z (07/27); 28 minutes wing-tip generators, 0 BIP; #1 Calgary.</p> |
| <p>July 27, Wednesday</p> | <p>Upper level split flow looked to stay in place through the nighttime hours. A shortwave trough was positioned over southeastern BC during the morning. This shortwave was forecasted to begin pushing into the region in the early afternoon. Weak PVA was expected to occur from the mid-afternoon through the overnight hours. At the low</p> | <p>HS3 was launched at 2021Z to a rapidly intensifying TITAN cell forming directly over Red Deer. The flight became airborne at 2038Z. HS3 started top seeding storm #1 for Red Deer at 2054Z. The aircraft continued seeding the thunderstorm as it pushed</p> |

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| | <p>levels and surface a small scale high pressure system was predicted to be centered over the far eastern part of the region. This high looked to produce upslope flow and moisture pooling along the foothills and project area. The air mass was expected to remain fairly unstable over the region, but speed shear values looked to be low throughout the forecast period.</p> <p>Towering cumulus clouds started forming over the southern half of the region during the late morning hours. Then in the early afternoon towering cumulus clouds began forming over the entire region. The strongest convection formed to the east of Red Deer during this same time. At roughly 2030Z a storm (#1) started forming directly over the northeasterly part of Red Deer. This thunderstorms gradually grew larger in area as it propagated westward toward the town of Sylvan. Radar data showed this storm may have produced grape size hail. During the mid-afternoon an outflow boundary started triggering off convection as it pushed southwestward over the northern part of the region. Storm #2 formed near Innisfail at roughly 2115Z. At this same time new convective developed occurred near Turner Valley and Black Diamond. New radar echoes then started forming over southern Calgary and near Rocky MH at 2230Z. The Calgary storm (#3) slowly grew over the southern part of the city. This particular storm was very nearly stationary. The Rocky MH TITAN cell (storm #4) formed along the foothills to the west of Caroline. This storm grew taller as it tracked northeastward toward Rocky MH. A line of thunderstorms (storm #5) then developed over the northern foothills and pushed across the project area during the evening.</p> <p>Pea to grape size hail reported in Red Deer. Terry Krauss reported 1 inch of rainfall at his house in Red Deer.</p> <p>Max cell top: 11.4km, 61.6 max dBz, 64.7 max VIL</p> <p>Tmax YC = 25.9C and no rain. Tmax QF = 26.6C and no rain. Tmax Radar = 25.1C and no rain.</p> | <p>westward toward the town of Sylvan. They then stopped seeding and repositioned to the Innisfail area at 2144Z. HS3 started top seeding storm #2 for Innisfail at 2145Z. They then stopped seeding and started patrolling the Bowden area at 2159Z. The aircraft next repositioned to the Turner Valley and Black Diamond area at 2209Z. They started patrolling Okotoks at 2230Z. At 2245Z HS3 started top seeding storm #3 for Calgary. They stopped seeding and RTB at 2351Z. They landed at 0013Z (07/28).</p> <p>HS4 was launched to a growing storm which was forming directly over Red Deer at 2042Z. The aircraft was airborne at 2105Z. They started seeding storm #1 for Red Deer at 2116Z. The crew continued to seeding this storm as it moved toward the town of Sylvan. HS4 then continued seeding as they repositioned to the Bowden area at 2152Z. Upon arriving at the thunderstorm, the crew was finding no inflow, so they stopped seeding and started patrolling the Bowden area at 2202Z. At 2220Z HS4 repositioned to the Rocky MH area. The aircraft began patrolling the Rocky MH area at 2238Z. Then at 2254Z they started seeding storm #4 for Rocky MH. The crew then stopped seeding and RTB at 2358Z. They landed at 0015Z (07/28).</p> <p>HS1 was launched to a growing storm over southern Calgary at 2330Z. The flight was airborne at 2350Z. At 0006Z (07/28) HS1 started top seeding storm #3 for Calgary. They then stopped seeding at 0034Z (07/28) and repositioned to Olds. At 0046Z (07/28) the aircraft started patrolling the Olds area. HS1 was then redirected to the Sundre area at 0113Z (07/28). They started top seeding storm #5 for Sundre at 0120Z (07/28). At 0149Z (07/28) HS1 stopped seeding and started patrolling for Olds. The crew then stopped patrolling and RTB at 0158Z (07/28). The aircraft landed at 0214Z (07/28).</p> <p>HS2 was launched at 2340Z to a storm continuing to gradually develop over the southern part of Calgary. The aircraft became airborne at 2357Z (07/28) and started patrolling the Cochrane area at this same time. At 0020Z (07/28) they were redirected to the Sundre area. HS2 started seeding storm #5 for Sundre at 0031Z (07/28). At 0153Z (07/28) they stopped seeding and RTB. The flight landed at 0212Z (07/28).</p> <p>HS5 was launched at 0125Z (07/28) to a line of TITAN cells approaching the town of Sundre. The flight became airborne at 0147Z (07/28) and they patrolled the Cochrane area for a</p> |
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| | | <p>short time before RTB. The aircraft landed at 0157Z (07/28).</p> <p>Flight Summary HS3: 2025Z (07/27)-0018Z (07/28); 175 EJ, 13 BIP; #1 Red Deer to Sylvan; #2 Innisfail; patrol Bowden; patrol Okotoks, #3 Calgary. HS4: 2055Z (07/27)-0020Z (07/28); 220 minutes wing-tip generators, 10 BIP; #1 Red Deer to Sylvan, patrol Bowden, #4 Rocky MH. HS1: 2340Z (07/27)-0216Z (07/28); 32 EJ, 13 BIP; #3 Calgary; patrol Olds; #5 Sundre. HS2: 2350Z (07/27)-0216Z (07/28); 164 minutes wing-tip generators, 4 BIP; patrol Cochrane, #5 Sundre. HS5: 0143Z-0200Z (07/28); no seeding; patrol Cochrane.</p> |
| <p>July 28, Thursday</p> | <p>The upper level jet stream looked to be over the area during the period. A shortwave trough was positioned to the west of Edmonton during the late morning. This positively tilted shortwave was forecasted to slide southeastward across the area during the afternoon and evening. Moderately strong PVA was expected. Warm moist air along with upslope conditions looked to continue to occur over the region throughout the forecast period. A cool front looked to push southward over the region in the late evening. Modified model soundings for the area showed anywhere from 800 to 1200J/kg for the afternoon and evening. 0 to 6km bulk speed shear values looked to range from 15 to 25kts which would likely be sufficient for long-lived TS.</p> <p>In the early morning a thunderstorm developed near the town of Rimbey. This storm very slowly pushed eastward in the northern buffer zone during the morning hours. Then in the mid-afternoon convection started to form over the Calgary area. During this same time a cluster of TITAN cells formed to the west of the town of Caroline. These convective cells merged into a long-lived, large storm which tracked southeastward through Cremona during the late afternoon hours. This storm (#1) became more linear as it pushed toward Airdrie and northern Calgary. The storm weakened before reaching any major populous areas. At around 2315Z another storm developed northeast of Rocky MH. This storm (#2) moved southeastward through Sylvan before dissipating. Starting around 0000Z (07/29) a new storm (#3) started to form directly over YBW. This storm intensified and became tall as it slid southeastward across Calgary. Radar data indicated this storm may have produced walnut size hail to the southeast of Calgary. The convective activity then shifted to the southeast of Calgary during the late evening hours. Scattered convective rain showers were observed over the southern half of the project area during the early nighttime hours.</p> <p>Nickel size hail reported in the Oakridge part of southwestern Calgary. Pea to pebble size hail reported in northwestern Calgary near Nose Hill park. Pea size hail reported in southeastern Calgary near</p> | <p>HS5 was launched at 2039Z to a convective cell forming directly over Calgary International Airport. The aircraft became airborne out of YBW at 2053Z. At 2059Z they started patrolling the Cochrane area. HS5 then repositioned to the Sundre area at 2159Z. At 2216Z the crew started top seeding storm #1 for Sundre. They then continued seeding as they descended to base seeding altitude at 2220Z. At 2246Z HS5 stopped seeding and started patrolling the same area for Sundre. Then at 2255Z the crew stopped patrolling and RTB. They landed in EA3 at 2305Z.</p> <p>HS2 was launched to an intensifying storm to the southwest of Sundre at 2255Z. The flight was airborne at 2312Z. At 2323Z HS2 started seeding storm #1 for Airdrie. They continued seeding this storm as it approached Airdrie and Calgary. HS2 then extended their line further south and began seeding storm #3 for Calgary at 0018Z (07/29). Then at 0127Z (07/29) they were out of seeding material, so HS2 stopped seeding and RTB. The aircraft landed at 0139Z (07/29).</p> <p>HS1 was launched at 2259Z to a growing storm southwest of Sundre. They became airborne at 2320Z. At 2339Z the aircraft started top seeding storm #1 for Calgary. HS1 then extended their line further south and began seeding storm #3 for Calgary at 0019Z (07/29). Then at 0102Z (07/29) the crew stopped seeding and RTB. They landed at 0115Z (07/29).</p> <p>HS4 was launched to a threatening storm southwest of Sundre at 2259Z. At 2321Z the aircraft was airborne and repositioned to a new storm northwest of Sylvan. HS4 started seeding storm #2 for Sylvan at 2336Z. At 2355Z the crew continued seeding as they repositioned to a long-lived storm moving toward Calgary. At 0014Z (07/29) HS4 was</p> |

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| | <p>Fairview.</p> <p>Max cell top: 11.4km, 63.5 max dBz, 73.1 max VIL</p> <p>Tmax YC = 26.1C and 15.2mm of rain. Tmax QF = 25.4C and 0.2mm of rain. Tmax Radar = 24.9C and no rain.</p> | <p>redirected to the Red Deer area. At this same time they turned off their wing-tip generators. At 0022Z (07/29) the convection over the Red Deer area was no longer a hail threat, so they RTB. The aircraft landed at 0030Z (07/29).</p> <p>HS3 was launched at 2309Z to a tall TITAN cell to the southwest of Sundre. They became airborne at 2326Z and repositioned to a growing storm approaching the town of Sylvan. They climbed to the top seeding altitude while enroute to this storm. At 2341Z HS3 started top seeding storm #2 for Sylvan. They stopped seeding and repositioned to the over the YBW area at 0002Z (07/29). At 0102Z (07/29) HS3 replaced HS1 with top seeding storm #3 for Calgary. Then then stopped seeding and started patrolling over the High River area at 0130Z (07/29). HS3 RTB at 0134Z (07/29). They landed at 0219Z (07/29).</p> <p>HS5 was launched to a long-lived TITAN cell west of Cremona at 2329Z. The flight became airborne out of EA3 at 2340Z. At 2345Z HS5 started base seeding storm #1 for Calgary. They then extended their line further south and began seeding storm #3 for Calgary at 0018Z (07/29). HS5 stopped seeding and RTB at 0104Z (07/29). The aircraft landed in YBW at 0113Z (07/29).</p> <p>Flight Summary HS5: 2045Z-2307Z; 0 EJ, 5 BIP; patrol Cochrane; #1 Sundre; takeoff YBW, land EA3. HS2: 2305Z (07/28)-0141Z (07/29); 234 minutes wing-tip generators, 23 BIP; #1 Airdrie; #3 Calgary. HS1: 2309Z (07/28)-0119Z (07/29); 283 EJ, 11 BIP; #1 Calgary, #3 Calgary. HS4: 2313Z (07/28)-0033Z (07/29); 76 minutes wing-tip generators, 4 BIP; #2 Sylvan. HS3: 2317Z (07/28)-0223Z (07/29); 122 EJ, 8 BIP; #2 Sylvan, #3 Calgary, patrol High River. HS5: 2335Z (07/28)-0115Z (07/29); 0 EJ, 21 BIP; #1 Calgary, #3 Calgary; takeoff EA3, land YBW.</p> |
| <p>July 29, Friday</p> | <p>An upper level low pressure system was centered over northern BC during the morning hours. This low was expected to deepen as it gradually tracked eastward over northern BC during the period. A wave of weak PVA looked to pass over the region roughly around the time of peak heating. A shortwave trough was forecasted to also begin moving across central AB during the late evening. At 850mb, theta-e ridge was predicted to be in place along with a low level jet. Surface lee cyclogenesis and a cold frontal passage were expected to occur during the overnight hours over the far northern part of the project area. A moderately unstable air mass looked to be in place across the entire region from the late afternoon through the overnight hours. Bulk Speed shear values appear to be on the order of 20kts.</p> | <p>No aircraft operations.</p> |

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| | <p>Mostly sunny skies were observed over the region through the early afternoon. Towering cumulus clouds then started to form along the foothills in the mid-afternoon. During the mid-afternoon an isolated thunderstorm formed near Ponoka. The convection which formed over the foothills dissipated as it attempted to push into the western project area. Overnight a north-south oriented line of convection quickly pushed eastward across the whole project area. Embedded thunderstorms were observed along the line of convective rain showers.</p> <p>Max cell top: 6.9km, 57.3 max dBz, 19.5 max VIL</p> <p>Tmax YC = 25.9C and no rain. Tmax QF = 27.0C and 0.8mm of rain. Tmax Radar = 25.6C and no rain.</p> | |
| <p>July 30, Saturday</p> | <p>A 65kt upper level jet streak was forecasted to round the south end of a closed low sitting over northern BC. A shortwave trough was expected to swing counter-clockwise around the low and appeared to push across the region during the afternoon hours. PVA looked to occur off and on throughout the period. Warm moist air along with upslope conditions were predicted to be present at the low levels and surface from the afternoon through the early nighttime hours. Tropospheric instability was expected to be high across the region in the afternoon through around the time of sunset. 0 to 6km bulk speed shear appeared to be approximately 30 to 35kts. The buoyancy layer effective bulk shear looked to be around 45kts.</p> <p>Tall thunderstorms started developing over the mountains and foothills in the early afternoon. These storms started pushing into the protected area in the mid-afternoon. After entering into the project area these storm formed into a large line of convection which extended from north of Cochrane all the way to Edmonton. This line pushed eastward across the entire region during the afternoon hours. Storm #1 formed over the foothills east of Cremona. This storm morphed into a larger and stronger storm as it quickly pushed eastward through Cremona and Airdrie. The second seeded storm of the day formed to the north of Rocky MH. This particular storm became linear as it slid eastward across the northern project area. Storm #3 developed west of Cochrane and moved eastward through Cochrane and northern Calgary. This severe storm also eventually went through Strathmore. The fourth seeded storm of the day (storm #4) formed along the foothills to the west of Calgary. This storm slid southeastward through the southern part of the Calgary. Scattered convective rain showers continued to form over the area through the early nighttime hours.</p> <p>Greater than golf ball size hail reported in Calgary. 5 to 6cm size hail reported W of Cremona and near Cochrane. Golf ball size hail reported in northwestern Calgary, northeastern Calgary, and the town of Water Valley (southwest of Cremona). Ping pong size hail observed in northern Airdrie.</p> | <p>HS1 was launched at 1752Z to a growing cell west of Calgary. They were airborne at 1815Z. At 1820Z HS1 started patrolling to the west of Calgary. They stopped patrolling and RTB at 1846Z. The aircraft landed at 1856Z.</p> <p>HS4 was launched to a thunderstorm to the west of Rocky MH at 2018Z. At 2035Z they became airborne out of YQF. HS4 began patrolling for Rocky MH at 2050Z. The aircraft then repositioned to another storm to the south of Sundre at 2052Z. At 2115Z HS4 started seeding storm #1 for Cremona. The crew continued seeding the storm as it moved toward Airdrie. At 2237Z they extended their line of seeding further to the south and started seeding storm #3 for Cochrane. The crew continued seeding the storm as it moved across Calgary. There were significant air traffic control restrictions over Calgary, so the aircraft was unable to seed northeastern Calgary efficiently. At 2314Z HS4 was low on fuel and out of seeding material, so they stopped seeding and RTB. The aircraft landed in YBW at 2321Z.</p> <p>HS5 was launched at 2109Z to a tall storm moving toward Cremona. The flight was airborne at 2127Z. At 2137Z HS5 started seeding with burn-in-place flares while climbing to the top seeding altitude. Once the aircraft reached the top seeding altitude, they continued top seeding storm #1 for Airdrie. HS5 then extended their seeding line to the south near the Cochrane area at 2217Z. They started top seeding storm #3 for Cochrane at 2224Z. HS5 was then out of ejectable flares, so they stopped seeding and RTB at 2259Z. The flight landed at 2310Z.</p> <p>HS2 was launched at 2130Z to a tall storm moving toward Cremona. The flight was airborne at 2145Z. The aircraft started seeding storm #1 for Cochrane at 2149Z. HS2 then</p> |

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| | <p>Up to toonie size hail was reported in Chestermere. Quarter size hail reported in Cochrane. Quarter size hail reported in southwest Calgary.</p> <p>Max cell top: 12.1km, 62.4 max dBz, 83.3 max VIL</p> <p>Tmax YC = 23.5C and 27.0mm of rain. Tmax QF = 23.8C and 7.4mm of rain. Tmax Radar = 21.5C and 11.7mm of rain.</p> | <p>extended their line to new growth west of Cochrane at 2216Z. They began seeding storm #3 for Cochrane at 2218Z. The crew continued seeding this storm as it pushed eastward through Calgary. There were significant air traffic control restrictions over Calgary, so the aircraft was unable to seed northeastern Calgary efficiently. At 2332Z they stopped seeding and RTB. The aircraft RTB due to being low on fuel and another storm approaching the YBW from the west. The flight landed at 2338Z.</p> <p>HS1 was launched in order orbit and patrol over the Olds area at 2130Z. The aircraft was airborne at 2149Z. The crew started patrolling at the base seeding altitude for the Olds area at 2207Z. Then at 2224Z they were redirected to a new storm forming west of Cochrane. They climbed to the top seeding altitude while enroute to this thunderstorm. At 2236Z the crew started top seeding storm #1 for Airdrie. HS1 then stopped seeding and started patrolling for Calgary at 2245Z. At 2301Z HS1 replaced HS5 with top seeding storm #3 for Calgary. There were significant air traffic control restrictions over Calgary, so the aircraft was unable to seed northeastern Calgary efficiently. HS1 then continued seeding as they extended their line to new growth along the southwestern part of the same storm at 2338Z. At 0002Z (07/31) they started base seeding storm #4 for Calgary. HS1 then stopped seeding and RTB at 0039Z (07/31). The flight landed at 0055Z (07/31).</p> <p>HS3 was launched to a cluster of thunderstorms north of Rocky MH at 2130Z. They became airborne at 2152Z. At 2207Z HS3 started top seeding storm #2 for Ponoka. At 2224Z the crew continued seeding as they descended to shed ice. HS3 stopped seeding and repositioned to the Strathmore area at 2229Z. At 2304Z HS3 started patrolling over the Strathmore area. There were significant air traffic control restrictions over Calgary, so the aircraft was unable to seed over northeastern Calgary. The crew then briefly base seeded storm #3 for Strathmore starting at 2337Z. At 2341Z the aircraft repositioned to a new storm (#4) developing to the west of Calgary. They started base seeding storm #4 for Calgary at 2349Z. The aircraft started climbing to the top seeding altitude at 2357Z. HS3 began top seeding storm #4 for Calgary at 0009Z (07/31). At 0040Z (07/31) they stopped seeding and RTB. The aircraft landed at 0110Z (07/31).</p> <p>HS4 flew a reposition flight. The flight was airborne out of YBW at 0201Z (07/31) and landed in YQF at 0232Z (07/31).</p> |
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| | | <p>Flight Summary HS1: 1804Z-1900Z; no seeding; patrol Calgary. HS4: 2026Z-2325Z; 240 minutes wing-tip generators, 19 BIP; patrol Rocky MH; #1 Cremona to Airdrie, #3 Cochrane to Calgary; takeoff YQF, land YBW. HS5: 2121Z-2312Z; 289 EJ, 20 BIP; #1 Airdrie; #3 Cochrane to Calgary. HS2: 2139Z-2341Z; 204 minutes wing-tip generators, 22 BIP; #1 Airdrie; #3 Cochrane to Calgary. HS1: 2140Z (07/30)-0057Z (07/31); 285 EJ, 15 BIP; patrol Olds; #1 Airdrie; #3 Calgary; #4 Calgary. HS3: 2142Z (07/30)-0115Z (07/31); 114 EJ, 13 BIP; #2 Ponoka; #3 Strathmore, #4 Calgary. HS4: 0152Z-0236Z (07/31); no seeding; reposition flight; takeoff YBW, land YQF.</p> |
| <p>July 31, Sunday</p> | <p>A strong upper level low was modeled to move east across central Alberta. PVA associated with this feature was forecast to foster convection through the afternoon and evening, followed by NVA overnight. Mid-tropospheric temperatures were anomalously cold, yielding significant instability with mostly clear skies across much of the project area. Modest speed shear was modeled over the project area, though directional shear was weak. Instability was predicted to fade quickly overnight, with no overnight hail concern.</p> <p>A band of clouds and showers trained across the southeast project area Sunday morning, gradually exiting to the east around noon. Scattered convective showers began to develop on the foothills and in the western project area after 19Z, though activity remained relatively weak through much of the afternoon. At 23Z, a broken line of stronger cells moved southeast across the western project border, with the southernmost cell, storm #1, intensifying and tracking toward Cochrane. This cell was seeded as it passed Cochrane and affected Calgary and Okotoks, dropping small to moderate size hail. The storm became elevated and weakened after hitting Okotoks around 0230Z (08/01), departed the project around 0330Z (08/01). Overnight, a broad area of weak rain showers enveloped the northern project area, with no significant hail threat.</p> <p>Max cell top: 9.9km, 62.6 max dBz, 64.8 max VIL</p> <p>Up to quarter size hail in Okotoks. Pea to marble size hail across western Calgary. Pea size hail in Calaway park south of Springbank.</p> <p>Tmax YC = 18.5C and 6.4mm of rain. Tmax QF = 19.3C and 4.2mm of rain. Tmax Radar = 17.9C and 0.8mm of rain.</p> | <p>HS2 was launched at 2314Z for developing convection northwest of Cochrane. They were airborne at 2330Z. HS2 began base seeding storm #1 Cochrane at 2338Z. HS2 stopped seeding and RTB at 0207Z (08/01). They landed at 0227Z (08/01).</p> <p>HS1 was launched at 2329Z. They were airborne at 2342Z. HS1 began seeding storm #1 Calgary at 2356Z. They descended to shed ice but continued seeding (base) at 0129Z (08/01). At 0151Z (08/01) HS1 returned to top seeding altitude, and continued seeding storm #1 (top). HS1 RTB at 0231Z (08/01), and landed at 0247Z (08/01).</p> <p>HS3 was launched at 0059Z (08/01) for thunderstorms near Calgary. They were airborne at 0113Z (08/01). HS3 began to patrol Calgary at 0147Z (08/01). They RTB at 0159Z (08/01), and landed at 0226Z (08/01).</p> <p>Flight Summary HS2: 2323Z (07/31)-0229Z (08/01); 298 min wing-tip generators, 23 BIP; #1 Cochrane to Okotoks. HS1: 2335Z (07/31)-0248Z (08/01); 258 EJ, 18 BIP; #1 Calgary to High River. HS3: 0105Z-0232Z (08/01); no seeding; patrol Calgary.</p> |
| <p>August 1, Monday</p> | <p>Zonal flow was modeled to amplify into a shortwave ridge Monday afternoon. Significant mid-level warming was forecast, producing dry and hostile convective conditions. No synoptic convective triggers were expected, and only</p> | <p>No aircraft operations.</p> |

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| | <p>shallow fair weather cumulus clouds were predicted through the forecast period.</p> <p>Residual showers from Sunday night's activity quickly dissipated Monday morning, and gave way to mostly clear skies Monday afternoon. A brief shallow shower briefly materialized southeast of Rocky MH around 19Z, otherwise no significant radar echoes were observed Monday afternoon and night.</p> <p>No TITAN Cells, 45.7 max dBz, 2.6 max VIL</p> <p>Tmax YC = 22.1C and no rain. Tmax QF = 22.6C and no rain. Tmax Radar = 22.1C and no rain.</p> | |
| <p>August 2, Tuesday</p> | <p>A strong upper level low was modeled to move east across far southern B.C. Strong PVA ahead of this system was forecast to affect the project area overnight. Surface flow was predicted to turn southeast, bringing warm moist air upslope, and triggering convection that was predicted break the cap and move into the project area. Strong instability and significant shear were anticipated, with the potential for a severe hail threat noted. Thunderstorms were forecast to continue overnight, bringing a flooding risk as rain continued into Wednesday.</p> <p>Quiet conditions Tuesday morning into Tuesday afternoon were shattered by widespread convective development along the foothills after 21Z. Storms were initially slow to leave the foothills, however the first seeded storm of the day did cross into the project area upwind of Cochrane around 23Z. It was seeded until it dissipated shortly before 0Z (08/03). The next seeded storm was observed developing over Calgary, and was seeded briefly until it was clear it was not going to become a hail threat to the city. Attention then turned to a stronger cell northeast of Cochrane. This cell, storm #3, was seeded as it moved toward Carstairs, until it also weakened. Storm #4 developed simultaneous with storm #3, but south of Cochrane, and was seeded for Cochrane until it passed through town and moved north-northwest, no longer threatening a project city. Aircraft then positioned to patrol a new wave of convection moving north out of the southern buffer. This activity remained relatively weak, generally beneath radar-indicated hail criteria, but was patrolled until it moved across the Cochrane-Calgary area. Convection proceeded to spread into a large swath of rain and thunderstorms Tuesday night, with stronger convective cells continuing in the southeast project area and buffer. The strongest radar-indicated hail threat occurred with this activity in the southeast corner of the project area at 0730Z, but never posed a significant threat to a protected city.</p> <p>Max cell top: 9.9km, 62.6 max dBz, 57.6 max VIL</p> <p>Marble size hail reported in Cochrane. Ice pellets in reported in Calgary.</p> <p>Tmax YC = 23.9C and 7.8mm of rain.</p> | <p>HS1 was launched at 2154Z for developing convection south of Cochrane. They were airborne at 2216Z. HS1 began to patrol Springbank at 2219Z. They began top seeding storm #1 Cochrane at 2258Z. HS1 stopped seeding but continued to patrol Cochrane at 2334Z. HS1 RTB at 2340Z, and landed at 2350Z.</p> <p>HS2 was launched at 2247Z for growing thunderstorms west of Calgary. They were airborne at 2301Z. At 2308Z, HS2 began base seeding storm #1 Cochrane. They stopped seeding but continued to patrol Cochrane at 2333Z. HS2 RTB at 2340Z, and landed at 2346Z.</p> <p>HS5 was launched at 2245Z to reposition away from thunderstorms approaching the YBW airport. They were airborne from YBW at 2303Z, and landed at EA3 at 2319Z.</p> <p>HS5 was launched from EA3 at 0013Z (08/03) for new convection immediately south of Springbank. They were airborne from EA3 at 0021Z (08/03). HS5 began to patrol Calgary at 0043Z (08/03). HS5 began top seeding storm #2 Calgary at 0059Z (08/03). HS5 repositioned to a stronger cell north of Cochrane at 0115Z (08/03), storm #3 Carstairs, seeding continuously in-transit. HS5 stopped seeding and began to patrol Cochrane at 0141Z (08/03). HS5 RTB at 0148Z (08/03), and landed in YBW at 0155Z (08/03).</p> <p>HS2 was launched at 0105Z (08/03) for thunderstorms near Calgary. They were airborne at 0118Z (08/03). HS2 began base seeding storm #4 Cochrane at 0129Z (08/03). They stopped seeding and continued to patrol Cochrane at 0147Z (08/03). HS2 repositioned to thunderstorms near High River at 0149Z (08/03). HS2 began patrolling High River at 0203Z (08/03). They RTB at 0213Z (08/03), and landed at 0223Z (08/03).</p> |

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| | <p>Tmax QF = 24.4C and 6.6mm of rain. Tmax Radar = 22.8C and 9.4mm of rain.</p> | <p>HS1 was launched at 0132Z (08/03) for thunderstorms moving north in the southern buffer. They were airborne at 0145Z (08/03). HS1 began patrolling High River at 0203Z (08/03). HS1 RTB at 0235Z (08/03), and landed at 0243Z (08/03).</p> <p>Flight Summary HS1: 2205Z-2354Z; 19 EJ, 4 BIP; #1 Cochrane. HS2: 2253Z-2348Z; 50 min wing-tip generators, 3 BIP; #1 Cochrane. HS5: 2256Z-2321Z; no seeding; reposition flight; takeoff YBW, land EA3. HS5: 0020Z-0159Z (08/03); 96 EJ, 3 BIP; #2 Calgary, #3 Carstairs, patrol Cochrane; takeoff EA3, land YBW. HS2: 0113Z-0225Z (08/03); 36 min wing-tip generators, 0 BIP; #4 Cochrane, patrol High River. HS1: 0139Z-0246Z (08/03); no seeding; patrol High River.</p> |
| <p>August 3, Wednesday</p> | <p>An upper level trough was observed over central Alberta Wednesday morning, and was forecast to move east into Saskatchewan through the day. Weak PVA was expected Wednesday afternoon, with NVA overnight. Instability was predicted to be curtailed by pervasive clouds and showers, though with an anomalously low convective temperature, any diurnal insolation was forecast to lead to convective initiation. All cells were expected to be short lived and only be capable of marginal hail threats. No convective activity was anticipated overnight.</p> <p>Widespread rain continued across much of the project area Wednesday morning, eventually departing to the east and becoming more scattered early Wednesday afternoon. Overcast skies became broken to scattered by mid-afternoon, quickly leading to convective cells in the northern and eastern project areas. Most convective activity remained weak, but as peak heating approached late Wednesday afternoon, a few convective cells became pulse radar-indicated hail threats, capable of pea size hail. The strongest of these formed east-northeast of Innisfail shortly before 1Z (08/04). All convection dissipated after 3Z, though a small area of weak showers pushed east across the central project area after midnight.</p> <p>Max cell top: 6.9km, 60.1 max dBz, 29.4 max VIL</p> <p>Tmax YC = 17.9C and 17.7mm of rain. Tmax QF = 19.9C and 5.4mm of rain. Tmax Radar = 18.1C and 8.6mm of rain.</p> | <p>No aircraft operations.</p> |
| <p>August 4, Thursday</p> | <p>A weak shortwave ridge was modeled to develop over the region while a strong upper level low moved south along the B.C. coast. No significant synoptic scale convective triggers were anticipated. Surface winds were prognosticated to shift southeasterly as a ridge traversed the project area, leading to upslope flow and the threat of convective development. A small hail threat was forecast</p> | <p>No aircraft operations.</p> |

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| | <p>with modest instability and shear.</p> <p>Mostly clear conditions Thursday morning gave way to scattered convection in the far western project area shortly after noon. This activity was relatively weak and remained widely scattered, but produced rain and a few lightning strikes as cells traversed east across the project area. The strongest radar indicated cell occurred north of Rimbey around 0Z (08/05), but never became a radar-indicated hail threat. All activity dissipated after dusk, although a cluster of rain showers did develop and move northeast between Innisfail and Red Deer from 8-11Z (08/05).</p> <p>Max cell top: 6.1km, 54.6 max dBz, 10.6 max VIL</p> <p>Tmax YC = 22.4C and no rain. Tmax QF = 23.2C and 0.4mm of rain. Tmax Radar = 22.5C and no rain.</p> | |
| <p>August 5, Friday</p> | <p>An upper level ridge was modeled to remain over east central Alberta Friday, while an upper level low stalled in far southwest B.C. Substantial southeasterly surface flow was observed, and was expected to continue through the period. A stout cap was forecast to stymie convection through much of the afternoon, though a window of convective opportunity was noted from the late afternoon into the overnight hours. Extreme instability was forecast to develop beneath the cap, which, along with modest shear, was expected to yield a potential for isolated severe thunderstorms. Considerable elevated instability was modeled to continue overnight, though with only subtle PVA, only weak convective showers were forecast.</p> <p>Clear, quiet weather conditions were observed across the project until early Friday evening. At 1Z (08/06), convection began developing along the foothills west of Turner Valley. This activity generally floundered away from the foothills, although it was patrolled by a top and base seeder due to its location upwind of project cities. A second isolated cell developed inside the project area southwest of Caroline, rapidly intensifying into a small radar-indicated hail threat, but dissipated without threatening a project city. Mostly clear conditions were then observed much of Friday night, with dense fog developing across portions of the project area.</p> <p>Max cell top: 9.1km, 54.8 max dBz, 24.2 max VIL</p> <p>Tmax YC = 24.0C and no rain. Tmax QF = 24.5C and no rain. Tmax Radar = 22.8C and no rain.</p> | <p>HS2 was launched at 0140Z (08/06) for developing convection on the foothills west of Turner Valley. They were airborne at 0153Z (08/06). HS2 began to patrol Calgary at 0157Z (08/06). They were repositioned to more intense convection near Caroline at 0207Z (08/06). HS2 RTB at 0233Z (08/06) and landed at 0304Z (08/06).</p> <p>HS5 was launched at 0140Z (08/06) for developing convection west of Turner Valley. They were airborne at 0210Z (08/06). HS5 began to patrol Calgary at 0213Z (08/06). They RTB at 0233Z (08/06), and landed at 0240Z (08/06).</p> <p>Flight Summary HS2: 0149Z-0307Z (08/06); no seeding; patrol Calgary. HS5: 0200Z-0245Z (08/06); no seeding; patrol Calgary.</p> |
| <p>August 6, Saturday</p> | <p>A strong upper level low was expected to remain nearly stationary over Vancouver Island. A disturbance along the eastern periphery of the low was modeled to affect the project area from late afternoon through the overnight hours. Clouds stemming from this disturbance were forecast to inhibit insolation, but strong instability was still expected with warm moist air advecting from the southeast. Shear was projected to be a concern with all discrete convection, and storm rotation was anticipated.</p> | <p>HS2 was launched at 0055Z (08/07) for convection developing immediately south of Calgary. They were airborne at 0113Z (08/07). HS2 began base seeding storm #1 Calgary at 0119Z (08/07). They stopped seeding but continued patrolling Calgary at 0242Z (08/07). HS2 RTB at 0245Z (08/07). They landed at 0257Z (08/07).</p> |

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| | <p>Elevated instability was expected to continue well into the overnight hours, with thunderstorms capable of small to moderate hail continuing overnight.</p> <p>An extensive area of clouds and embedded rain showers spread from south to north across the project area late Saturday morning through the afternoon. Scattered stronger convection began to develop near the southern extent of the disturbance just after 0Z (08/07), including a particularly strong cell developing within the Calgary city limits. This storm was seeded (storm #1) as it evolved into a cluster of cells that affected Calgary between 0-3Z (08/07), producing up to penny size hail in the city. Rotation was detected with this storm, and a tornado warning was issued, but no tornado reports were received. Linear thunderstorms continued to develop and spread across the project area Saturday night, but no other appreciable hail threats materialized.</p> <p>Penny size hail reported in northwest Calgary (Nose Hill).</p> <p>Max cell top: 11.4km, 61.0 max dBz, 47.7 max VIL</p> <p>Tmax YC = 18.2C and 29.2mm of rain. Tmax QF = 21.8C and 8.2mm of rain. Tmax Radar = 18.8C and 5.8mm of rain.</p> | <p>HS1 was launched at 0055Z (08/07) for convection developing immediately south of Calgary. They were airborne at 0114Z (08/07). HS1 began top seeding storm #1 Calgary at 0124Z (08/07). HS1 stopped seeding and descended to shed ice at 0236Z (08/07). HS1 RTB at 0302Z (08/07), and landed at 0310Z (08/07).</p> <p>Flight Summary HS2: 0104Z-0301Z (08/07); 166 min wing-tip generators; 12 BIP; #1 Calgary. HS1: 0107Z-0312Z (08/07); 79 EJ, 7 BIP; #1 Calgary.</p> |
| <p>August 7, Sunday</p> | <p>An upper level closed low was centered over the southwestern part of BC during the morning hours. This low was expected to creep eastward along the international border over the next few days. A 65kt jet streak appeared to round the south end of the low and looked to nose its way into the area during the late afternoon. A shortwave trough was expected to push northeastward across the area during the early evening hours. Upslope flow at the low levels and surface was forecasted to cause moisture pooling over the region starting in the late afternoon. The troposphere was predicted to be fairly unstable throughout the most of the daytime over the CYYC area with CAPE values averaging around 1700J/kg.</p> <p>Towering cumulus clouds formed over parts of the protected area during the afternoon. In the late afternoon isolated convective rain showers fell over the region. At this same time thunderstorms formed over the foothills and mountains, but these storms remained outside of the project area. In the evening a line of weak thunderstorms formed over the southern foothills and slowly tried to push into the western part of the project area. These thunderstorms were short-lived and posed in minimal hail threat. Radar data indicated pea size hail may have fallen over a small area to the west of Calgary.</p> <p>Max cell top: 6.9km, 57.8 max dBz, 27.6 max VIL</p> <p>Tmax YC = 27.6C and 4.4mm of rain. Tmax QF = 22.2C and no rain. Tmax Radar = 21.3C and no rain.</p> | <p>No aircraft operations.</p> |
| <p>August 8, Monday</p> | <p>A mid and upper level low was centered over Victoria, BC and was expected to slowly slide eastward over</p> | <p>HS1 flew a maintenance flight. The aircraft was airborne out of YBW at 1535Z and landed in</p> |

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| | <p>Washington during the period. Due to the proximity of the low, weak to moderately strong PVA was forecasted to occur over the region throughout the day and night. Weak upslope conditions looked to occur at the low levels and surface. Area modified model soundings showed the region would stay moderately unstable through the overnight hours. The 0 to 6km bulk speed shear looked to be around 5 to 10kts, so thunderstorms were expected to be short-lived. Furthermore, the buoyancy layer effective bulk shear was also very low, only around 10kts.</p> <p>Thunderstorms began forming over the mountains and foothills to the west of Sundre during the morning. Starting around 17Z a cluster of convective storm cells developed along the foothills northwest of Cochrane. This convection then began to push into the project area in the early afternoon. At approximately 1930Z storm #1 formed northwest of Cochrane along the edge of the foothills. The thunderstorm then slowly tracked southeastward through Cochrane and across the entire city of Calgary. This thunderstorm grew taller as it slid across Calgary. Radar data suggested grape size hail may have fallen over Calgary. In the evening thunderstorms formed along the southern foothills. The tallest of these thunderstorms hugged the foothills as it propagated south-southeastward. This particular storm did not threaten any populated areas as it moved it to the far southwestern part of the project area. During the overnight hours scattered convective rain showers and short-lived weak thunderstorms were observed near Sundre and Red Deer.</p> <p>Pea to dime size hail reported in Calgary.</p> <p>Max cell top: 10.6km, 60.1 max dBz, 48.9 max VIL</p> <p>Tmax YC = 20.8C and 0.8mm of rain. Tmax QF = 21.6C and 0.2mm of rain. Tmax Radar = 21.3C and no rain.</p> | <p>YQF at 1604Z.</p> <p>HS3 was launched at 2125Z to a storm moving toward the Calgary area. The aircraft became airborne at 2148Z. At 2216Z HS3 started top seeding storm #1 for Calgary. They stopped seeding and started patrolling for Calgary at 2232Z. The crew then resumed top seeding storm #1 for Calgary at 2243Z. At 2252Z the aircraft stopped seeding and started patrolling the Okotoks area. The flight RTB at 2301Z, and they landed at 2330Z.</p> <p>HS2 was launched to a TITAN cell pushing southeastward toward northwestern Calgary at 2134Z. They were airborne at 2147Z. At 2151Z HS2 started base seeding storm #1 for Calgary. The aircraft was restricted by air traffic control starting at 2156Z. Air traffic control did not allow the aircraft to fly any further east than Nose Hill. Then at 2207Z air traffic control started allowing the flight to fly and seed east of the Nose Hill area. They continued seeding this storm as it tracked southeastward across the entire city. The flight stopped seeding and RTB at 2253Z. The aircraft landed at 2302Z.</p> <p>HS1 then flew a return maintenance flight. The aircraft was airborne out of YQF at 2248Z and landed in YBW at 2313Z.</p> <p>Flight Summary HS1: 1525Z-1607Z; no seeding; maintenance flight; takeoff YBW, land YQF. HS3: 2137Z-2335Z; 123 EJ, 0 BIP; #1 Calgary; patrol Okotoks. HS2: 2140Z-2304Z; 124 minutes wing-tip generators, 8 BIP; #1 Calgary. HS1: 2239Z-2314Z; no seeding; maintenance flight; takeoff YQF, land YBW.</p> |
| <p>August 9, Tuesday</p> | <p>The mid and upper level low was positioned over eastern Washington early in the period. This low was forecasted to slide eastward along the international border during the forecast period and appeared to be centered along the AB/Montana border by the late overnight hours. Several waves of weak PVA looked to pass over the region from the south during the day and night due to the low. Warm moist air was predicted to be advected into the area from the SE at the low levels. Upslope flow appeared to be strongest along the northern foothills. The CYYC and CYQF modified model soundings suggested CAPE values would be roughly 1200J/kg during the afternoon with moderate speed shear.</p> <p>In the morning low top thunderstorms formed to the east of Ponoka. Towering cumulus started developing over the region in the late morning. A few of these towering cumulus clouds developed into isolated thunderstorms over the northern half of the project area. Storm #1 developed over Red Deer and moved northeastward across the city. A line of thunderstorms then began to</p> | <p>HS4 was launched at 1859Z to growing convection over the Red Deer area. The flight became airborne at 1920Z. At 1925Z HS4 started base seeding storm #1 for Red Deer. They then stopped seeding and started patrolling the Red Deer area at 1937Z. The aircraft stopped patrolling and RTB at 1945Z. They landed at 1953Z.</p> <p>HS5 was launched at 2124Z to a strengthening thunderstorm to the southwest of Strathmore. They became airborne at 2145Z. HS5 started patrolling for Strathmore beginning at 2155Z. At 2214Z they repositioned to a stronger storm moving off the foothills west of Cremona. Then at 2223Z HS5 was redirected to new convective growth forming directly over Calgary. At 2226Z the crew started patrolling the Calgary area. The aircraft then repositioned to the foothills northwest of Cochrane at 2244Z. At 2257Z HS5 started top seeding</p> |

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| | <p>form along the foothills west of Sundre in the mid-afternoon. This convective line (storm #2) pushed eastward into the area. At this same time another storm (#3) intensified west of Cremona. Storms #2 and #3 were part of a long line of thunderstorms which extended from Caroline southward to Cremona. At 22Z short-lived thunderstorms formed over Calgary and near Strathmore. The fourth storm of the day formed along the far northern part of the same line of thunderstorms. This storm (#4) formed south of Caroline and slid eastward toward Innisfail. Another storm (#5) then formed directly over Red Deer which developed along the very northern end of the line of thunderstorms. New convection continued forming along the north end of this line of thunderstorms. This convection eventually developed into storm #6 which tracked eastward through Blackfalds and Red Deer. The entire line of thunderstorms then shifted east of Red Deer, Olds, and Airdrie during the early evening hours. Radar data suggested penny size hail may have fallen near Irricana. Overnight, isolated low top thunderstorms formed over the southern part of the protected area.</p> <p>Terry Krauss measured pea to grape size hail at his house in Red Deer. Pea size hail reported in Olds and Langdon. Graupel was observed in Penhold.</p> <p>Max cell top: 11.4km, 60.7 max dBz, 53.4 max VIL</p> <p>Tmax YC = 22.7C and no rain. Tmax QF = 23.9C and 5.8mm of rain. Tmax Radar = 22.6C and 2.0mm of rain.</p> | <p>storm #3 for Cremona. The crew continued seeding this long line of thunderstorms as it pushed eastward toward the Olds and Airdrie area. Then at 0047Z (08/10) they stopped seeding and RTB. The aircraft landed at 0057Z (08/10).</p> <p>HS4 was launched to several TITAN cells moving toward Sundre at 2129Z. The aircraft was airborne at 2152Z. The flight started base seeding storm #2 for Sundre at 2213Z. At 2226Z they were redirected to the south end of the line of thunderstorms which was west of Cremona. HS4 continued seeding as they repositioned to the south. The aircraft began base seeding storm #3 for Cremona at 2239Z. At 2253Z HS4 continued seeding along the line of thunderstorms as they repositioned to the Innisfail area. They then started seeding storm #4 for Innisfail at 2258Z. At 2350Z the aircraft extended their seeding line to the Red Deer area in order to start base seeding storm #5 for Red Deer. HS4 stopped seeding and RTB at 0112Z (08/10). The flight landed at 0031Z (08/10).</p> <p>HS3 was launched at 2230Z in order to patrol the Red Deer area. The flight became airborne at 2248Z and started patrolling the Red Deer area. HS3 began top seeding storm #5 for Red Deer at 2335Z. At 0015Z (08/10) the crew stopped seeding and started patrolling the same area for Red Deer. They started top seeding storm #6 for Red Deer 0030Z (08/10). The crew then stopped seeding and started patrolling the Blackfalds area at 0042Z (08/10). At 0050Z (08/10) HS3 stopped patrolling and RTB. The flight landed at 0059Z (08/10).</p> <p>HS2 was launched to a tall thunderstorm moving toward Cremona at 2230Z. They were airborne at 2254Z. The aircraft started base seeding storm #3 for Cremona at 2304Z. Then at 2334Z HS2 extended their seeding line further to north and started seeding the same storm for Olds. HS2 continued seeding this linear storm as it slid eastward toward the Olds and Airdrie area. At 0019Z (08/10) HS2 stopped seeding and started patrolling for Airdrie. They then stopped patrolling at 0047Z (08/10) and RTB. The aircraft the landed 0054Z (08/10).</p> <p>Flight Summary HS4: 1907Z-1956Z; 24 minutes wing-tip generators, 0 BIP; #1 Red Deer. HS5: 2135Z (08/09)-0100Z (08/10); 268 E.J, 4 BIP; patrol Strathmore, patrol Calgary, #3 Cremona to Olds. HS4: 2146Z (08/09)-0034Z (08/10); 238 minutes wing-tip generators, 6 BIP; #2 Sundre, #3 Cremona, #4 Innisfail, #5 Red Deer.</p> |
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| | | <p>HS3: 2236Z (08/09)-0104Z (08/10); 154 EJ, 7 BIP; #5 Red Deer, #6 Red Deer, patrol Blackfalds. HS2: 2247Z (08/09)-0058Z (08/10); 150 minutes wing-tip generators, 7 BIP; #3 Cremona to Olds; patrol Airdrie.</p> |
| <p>August 10, Wednesday</p> | <p>The mid and upper level low was centered along the AB/Montana border during the morning. This low was predicted to slide northeastward into southern SK in the late afternoon. The strongest PVA appeared to stay south and east of the area. Never the less, weaker PVA still looked to occur during the daytime. Modified model soundings for 21Z and 00Z (08/11) showed anywhere from 500 to 1000J/kg of CAPE. 0 to 6km bulk speed shear values were expected to be around 10kts. The tropopause looked to be around 35kft.</p> <p>Low top thunderstorms formed near the High River area during the early morning hours. In the afternoon scattered thunderstorms formed over the entire project area. Storm #1 formed north of Airdrie and tracked southward through Airdrie. Radar data suggested grape size hail may have fallen west of Airdrie. The second seeded storm of the day formed directly over Calgary. Both of these thunderstorms were relatively short-lived and posed a marginal hail threat. Scattered short-lived thunderstorms continued to form over the region through the early evening. Scattered convective rain showers then fell in the late evening into the overnight hours.</p> <p>Max cell top: 9.9km, 60.5 max dBz, 38.7 max VIL</p> <p>Tmax YC = 18.7C and 4.1mm of rain. Tmax QF = 18.6C and 6.4mm of rain. Tmax Radar = 19.1C and 3.6mm of rain.</p> | <p>Radar tour #3 was conducted at the Olds-Didsbury airport and 25 people were in attendance.</p> <p>HS4 flew a PR flight. The aircraft was airborne out of YQF at 1636Z and landed in EA3 at 1655Z.</p> <p>HS4 was launched at 1859Z to a thunderstorm moving toward Cochrane and Calgary. The aircraft became airborne out of EA3 at 1912Z. At 1913Z they started patrolling the Didsbury area. Then at 1914Z HS4 reported cloud bases were too low in order to safely base seed, so they RTB. The aircraft landed in EA3 at 1923Z.</p> <p>HS1 was launched to a growing cluster of thunderstorms north of Cremona at 1901Z. The flight was airborne at 1919Z. HS1 began patrolling north of Calgary at 1924Z. At 1944Z they started top seeding storm #1 for Airdrie. HS1 then extended their line southward to new growth forming directly over Calgary at 1954Z. The crew started top seeding storm #2 for Calgary at 1958Z. At 2012Z the aircraft stopped seeding and RTB. They landed at 2024Z.</p> <p>HS4 then flew a return PR flight. The aircraft was airborne out of EA3 at 2220Z and landed in YQF at 2246Z.</p> <p>Flight Summary HS4: 1627Z-1657Z; no seeding; PR flight; takeoff YQF, land EA3. HS4: 1906Z-1926Z; no seeding; patrol Didsbury; takeoff EA3, land EA3. HS1: 1911Z-2026Z; 38 EJ, 1 BIP; #1 Airdrie, #2 Calgary. HS4: 2215Z-2250Z; no seeding; PR flight; takeoff EA3, land YQF.</p> |
| <p>August 11, Thursday</p> | <p>A mid and upper level ridge was predicted to begin building over BC. In the afternoon a weak shortwave trough was expected to propagate southeastward through the NW flow of the ridge. PVA from the shortwave appeared to be possible in the afternoon and evening. Weak upslope conditions looked to be possible at the low levels and surface in the late afternoon into the evening. The air mass across the region looked to be moderately unstable with CAPE values ranging from 400 to 900J/kg. 0 to 6km bulk speed shear values appeared to be around 25kts which looked to be strong enough for long-lived thunderstorms.</p> | <p>HS2 was launched at 2243Z to a thunderstorm forming along the foothills to the northwest of Cochrane. The flight became airborne at 2256Z. At 2300Z HS2 started patrolling the Cochrane area. HS2 began base seeding storm #1 for Calgary at 2306Z. At 2345Z the crew reported encountering restrictions with air traffic control at the base seeding altitude, so they continued seeding with the wing-tip generators as the aircraft climbed up to the top seeding altitude. The crew started seeding the same storm at the top seeding altitude at 2355Z. At 0026Z (08/12) HS2 stopped seeding</p> |

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| | <p>During the early afternoon towering cumulus and cumulus congestus clouds began forming over the area. A few of these clouds grew into thunderstorms which tracked southeastward across the area. Storm #1 developed over the foothills west of Cremona at approximately 21Z. This thunderstorm became long-lived and pushed southeastward through Cochrane and Calgary. During this same time isolated thunderstorms formed along the western half of the protected area and tracked southeastward. Weaker thunderstorm activity then occurred in the evening through the time of sunset. Scattered convective rain showers were observed over most of the region during the nighttime hours.</p> <p>Pea size hail was reported in Cochrane.</p> <p>Max cell top: 8.4km, 59.1 max dBz, 30.2 max VIL</p> <p>Tmax YC = 22.0C and 5.7mm of rain. Tmax QF = 22.7C and 0.8mm of rain. Tmax Radar = 22.1C and 3.3mm of rain.</p> | <p>and RTB. They landed at 0039Z (08/12).</p> <p>Flight Summary HS2: 2250Z (08/11)-0042Z (08/12); 160 minutes wing-tip generators, 7 BIP; #1 Calgary.</p> |
| <p>August 12, Friday</p> | <p>A mid and upper level ridge was expected to build over AB through the evening hours. Overnight the ridge was predicted to flatten as a shortwave trough began to push eastward across BC. A shortwave trough appeared to slide southeastward across the region during the afternoon hours. Moderately strong PVA looked to be associated with the shortwave. 500mb temperatures were forecasted to warm by roughly 3C during the daytime. Afternoon modified model soundings for the region showed anywhere from 100 to 300J/kg of CAPE. Due to the combination of drier air aloft and warmer temperatures at the mid-levels, thunderstorm updrafts were expected to struggle to become taller than 7km (23kft) MSL.</p> <p>Scattered convective rain showers fell over the region during the afternoon hours. A few isolated short-lived thunderstorms formed over the region during the time of peak heating. This convection then dissipated during the evening and mostly clear skies were observed overnight.</p> <p>Max cell top: 4.6km, 52.7 max dBz, 9.4 max VIL</p> <p>Tmax YC = 22.0C and 0.6mm of rain. Tmax QF = 22.7C and no rain. Tmax Radar = 21.8C and 1.3mm of rain.</p> | <p>No aircraft operations.</p> |
| <p>August 13, Saturday</p> | <p>The ridge of high pressure was predicted to flatten as a shortwave trough slid eastward across AB in the late afternoon and evening. Moderately strong PVA looked to occur with the trough. 500mb temperatures were expected to cool by around 1C. At the low levels and surface, lee cyclogenesis looked to occur near Sundre around the time of peak heating which would allow for upslope conditions to occur over the northern half of the protected area. Model sounding output data suggested a moderately strong cap would be in place across the area throughout the day. Modified model soundings for 00Z (08/14) and 03Z (08/14) showed a loaded gun situation. The cap looked to be weaker in the north.</p> | <p>HS2 was launched to a cluster of thunderstorms near the Rocky MH area at 0246Z (08/14). The flight became airborne at 0313Z (08/14). At 0334Z (08/14) HS2 started base seeding storm #1 for Caroline. At 0355Z (08/14) the aircraft stopped seeding and started patrolling the Olds and Didsbury area. They then stopped patrolling and RTB at 0443Z (08/14). The aircraft landed at 0458Z (08/14).</p> <p>HS4 was launched at 0256Z (08/14) to a tall storm moving toward Sylvan. The aircraft was</p> |

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| | <p>Cirrus and altocumulus clouds were observed over the area through the early afternoon. A chinook arch cloud formed over the southern half of the protected area during the afternoon hours. In the mid-afternoon, cumulus clouds started forming over the northern part of the region. Then in the evening a cluster of TITAN cells formed northwest of Rocky MH. This storm (#1) became multicellular and elevated as it pushed southeastward across the entire northern half of the project area during the late evening and early nighttime hours. Radar data indicated grape size hail may have fell to the southwest of Rocky MH.</p> <p>Max cell top: 10.6km, 62.9 max dBz, 61.4 max VIL</p> <p>Tmax YC = 24.5C and no rain. Tmax QF = 26.2C and 7.0mm of rain. Tmax Radar = 24.8C and no rain.</p> | <p>airborne at 0315Z (08/14). The crew then started base seeding storm #1 for Caroline at 0330Z (08/14). At 0354Z (08/14) they stopped seeding and RTB. The flight landed at 0406Z (08/14).</p> <p>HS3 was launched to growing convection moving toward Sylvan at 0303Z (08/14). They became airborne at 0323Z (08/14). HS3 started patrolling over Sundre at 0344Z (08/14). At 0354Z (08/14) the crew stopped patrolling and RTB. They landed at 0410Z (08/14).</p> <p>Flight Summary HS2: 0305Z-0503Z (08/14); 42 minutes wing-tip generators, 4 BIP; #1 Caroline, patrol Olds and Didsbury. HS4: 0307Z-0410Z (08/14); 48 minutes wing-tip generators, 4 BIP; #1 Caroline. HS3: 0309Z-0415Z (08/14); no seeding; patrol Sundre.</p> |
| <p>August 14, Sunday</p> | <p>A subtle shortwave trough ahead of a broadening upper level ridge was modeled to pass through the project area. Strong insolation and significant low-level moisture were forecast to yield severe instability, with a minimal cap in place. Marginal directional and speed shear was anticipated, sufficient for multicellular thunderstorms. Instability was expected to diminish following peak heating, with no hail concerns forecast after dusk.</p> <p>Scattered convection developed across the foothills early Sunday afternoon, but dissipated as it moved east toward the project area. One convective cell northwest of Cochrane began to show much stronger characteristics around 21Z, and was seeded (storm #1) in the event it moved off the foothills toward Calgary. At 22Z, a new cell immediately south of storm #1 began to overtake the existing storm, and became extremely powerful. It was seeded (storm #2) as it moved southeast, nearly parallel with the western project boundary, immediately west of the project border. While this storm was moving southeast outside of the project area, two other areas of developing convection became a concern. The first of these was a cluster of cells northwest of Rocky MH, which was seeded (storm #3) as it tracked southeast through town before dissipating. The second was development observed directly over the city of Calgary (storm #4), but this did not develop into a significant hail threat. Attention then returned to storm #2, which at 23Z deformed, weakened slightly, and jumped east into the project area near Okotoks. It was seeded as it passed near town, and was left as it continued east-southeast away from protected project cities. Storm #2 ultimately exited out of the southeast buffer around 0130Z (08/15). Scattered thundershowers continued from Sunday evening through the early overnight hours, but no further hail threats materialized.</p> <p>Max cell top: 11.4 km, 61.9 max dBz, 63.7 max VIL</p> | <p>HS2 was launched at 2058Z for strong convection northwest of Cochrane. They were airborne at 2117Z. HS2 began patrolling Cochrane at 2117Z. HS2 began base seeding storm #1 Calgary at 2147Z. HS2 began seeding a new cell overtaking the initial cell, storm #2 Turner Valley, at 2215Z. They repositioned to new convection developing over Calgary at 2240Z, storm #4 Calgary, seeding in transit. HS2 repositioned back to storm #2 northwest of Turner Valley at 2252Z, seeding continuously in transit. HS2 stopped seeding and RTB 2359Z. They landed at 0010Z (08/15).</p> <p>HS1 was launched at 2058Z for strong convection northwest of Cochrane. They were airborne at 2115Z. HS1 began patrolling Cochrane at 2115Z. HS1 began top seeding storm #1 Calgary at 2147Z. HS1 began seeding a new cell overtaking the initial cell, storm #2 Turner Valley, at 2213Z. HS1 repositioned to new growth over Calgary at 2240Z. HS1 began seeding storm #4 Calgary at 2251Z. HS1 repositioned back to storm #2 northwest of Turner Valley at 2254Z. They resumed top seeding storm #2 Turner Valley at 2301Z. HS1 stopped seeding and RTB at 2356Z. They landed at 0006Z (08/15).</p> <p>HS4 was launched at 2104Z to reposition to Rocky MH. They were airborne from YQF at 2119Z, and landed at WRM at 2144Z.</p> <p>HS5 was launched at 2146Z to reposition away from storms approaching Springbank. They were airborne from YBW at 2207Z, and landed at EA3 at 2224Z.</p> |

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| | <p>Tmax YC = 24.3C and 4.9mm of rain. Tmax QF = 25.0C and 0.2mm of rain. Tmax Radar = 24.5C and a trace of rain.</p> | <p>HS4 was launched at 2209Z from Rocky MH for new convection approaching the city. They were airborne at 2218Z. HS4 began seeding storm #3 Rocky MH at 2225Z. HS4 stopped seeding and repositioned toward Calgary at 2244Z. HS4 began to patrol Sundre at 2301Z. HS4 RTB at 2313Z, and landed at 2326Z.</p> <p>HS5 was launched at 2359Z to reposition back to Springbank. They were airborne from EA3 at 0005Z (08/15), and landed in YBW at 0023Z (08/15).</p> <p>Flight Summary HS2: 2108Z (08/14)-0012Z (08/15); 264 min wing-tip generators, 6 BIP; #1 Calgary, #2 Turner Valley to Okotoks, #4 Calgary, patrol Cochrane. HS1: 2109Z (08/14)-0009Z (08/15); 176 EJ, 13 BIP; #1 Calgary, #2 Turner Valley to Okotoks, #4 Calgary, patrol Cochrane. HS4: 2111Z-2146Z; no seeding; reposition flight; takeoff YQF, land WRM. HS5: 2155Z-2226Z; no seeding; reposition flight; takeoff YBW, land EA3. HS4: 2213Z-2328Z; 38 min wing-tip generators; 2 BIP; #3 Rocky MH, patrol Sundre; takeoff WRM, land YQF. HS5: 2359Z (08/14)-0027Z (08/15); no seeding; reposition flight; takeoff EA3, land YBW.</p> |
| <p>August 15, Monday</p> | <p>A broad upper level ridge was modeled to spread into western Alberta. Strong mid-level warming was anticipated, with 500mb temperatures rising nearly 3C by Monday evening. Despite this convective detriment, modest instability was still forecast over the foothills and southern project area. No synoptic scale convective triggers were foreseen, but orographic convection was anticipated, potentially bringing weakening showers across the western project boundary. No convective concerns were expected overnight.</p> <p>Isolated altocumulus clouds were noted in the southern project area Monday morning, otherwise mostly clear skies were observed throughout the forecast period.</p> <p>No TITAN cells or discernable meteorological echoes. Altocumulus clouds with modest depth were observed in the project area.</p> <p>Tmax YC = 24.5C and no rain. Tmax QF = 25.2C and no rain. Tmax Radar = 24.4C and no rain.</p> | <p>No aircraft operations.</p> |
| <p>August 16, Tuesday</p> | <p>An upper level ridge over the project area was modeled to flatten and depart the region. A strong cold front was forecast to develop over central Alberta, and move southeast across the project area late Tuesday evening and overnight. Diurnal convection was expected to be stifled by a strong cap, but heat and instability building under the cap were forecast to elicit strong convection</p> | <p>A radar tour was conducted at the Olds-Didsbury airport with 26 people in attendance.</p> <p>HS5 flew a PR flight. They were airborne from YBW at 1744Z and landed in EA3 at 1800Z.</p> <p>HS4 was launched at 2348Z for convection</p> |

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| | <p>capable of moderate hail when frontal forcing arrived. Speed shear was projected to be modest with the convection, but nearly unidirectional aloft, with a linear convective mode anticipated. A convective threat was expected to continue through the overnight hours until the front exited the project area.</p> <p>Clear conditions were observed across the project until late Tuesday afternoon. Around 23Z, isolated convective cells began to develop along a prefrontal trough that extended northwest from Limestone mountain to the northeast corner of the project buffer. One cell, which would become the first seeded storm (#1), formed on this boundary south of Rocky MH, and rapidly intensified into a hail threat upstream of Innisfail. It was seeded until it abruptly dissipated around 0045Z (08/17). New convection continued to develop as the boundary pushed south, with a new rapidly intensifying storm developing just west of Sundre around 1Z. This cell, storm #2, showed supercellular characteristics, and visually appeared to be a LP supercell. This storm was seeded as it passed very close to Sundre, and was continually seeded as it tracked toward Didsbury. Storm spotter reports indicate up to 5.5cm hail fell in Westcott, AB, with other reports indicating quarter and toonie size hail along the path of this storm. The cell began to dissipate as it approached the QE2 north of Carstairs, and attention then turned to new convection developing along the trough/outflow boundary west of Cremona. This new storm (storm #3) was seeded heavily as it moved southeast toward northern Calgary, but dissipated around 4Z before reaching the city. Scattered showers and thunderstorms then developed across the northern project area late Tuesday evening, and persisted much of the night.</p> <p>5.5cm size hail reported in the Westcott area 14km west-southwest of Didsbury. Toonie size hail reported south-southwest of Didsbury. Quarter size hail reported near Sundre.</p> <p>Max cell top: 12.1km, 61.1 max dBz, 62.5 max VIL</p> <p>Tmax YC = 27.4C and no rain. Tmax QF = 27.0C and 5.8mm of rain. Tmax Radar = 26.7C and a trace of rain.</p> | <p>intensifying near Caroline. They were airborne at 0011Z (08/17). HS4 began to patrol Innisfail at 0049Z (08/17), and RTB at 0053Z (08/17). They landed at 0102Z (08/17).</p> <p>HS5 was launched from Olds at 2351Z for convection intensifying near Caroline. They were airborne from EA3 at 0006Z (08/17). HS5 began top seeding storm #1 Innisfail at 0024Z (08/17). They stopped seeding and repositioned to a new cell west of Sundre at 0057Z (08/17). HS5 started seeding storm #2 Sundre at 0108Z (08/17). They stopped seeding and RTB Springbank at 0240Z (08/17). HS5 landed in YBW at 0251Z (08/17).</p> <p>HS2 was launched at 0002Z (08/17) for convection intensifying near Caroline. They were airborne at 0036Z (08/17). HS2 began to patrol Sundre at 0053Z (08/17), and began base seeding storm #2 Sundre at 0058Z (08/17). HS2 stopped seeding and RTB Red Deer at 0235Z (08/17). They landed in YQF at 0250Z (08/17).</p> <p>HS1 was launched at 0154Z (08/17) for a strong thunderstorm west of Didsbury. They were airborne at 0216Z (08/17). They began patrolling Cochrane at 0216Z (08/17). HS1 began top seeding storm #3 Calgary at 0247Z (08/17). At 0336Z (08/17) the aircraft was out of ejectable flares and there was no room at cloud base due to air traffic control restrictions, so they stopped seeding and RTB. The flight landed at 0348Z (08/17).</p> <p>HS4 was launched at 0206Z (08/17) for convection propagating south along an outflow boundary north of Cochrane. They were airborne at 0217Z (08/17). HS4 started base seeding storm #3 Calgary at 0245Z (08/17). At 0353Z (08/17) the crew stopped seeding and RTB. At 0420Z (08/17) the aircraft landed.</p> <p>HS3 was launched at 0247Z (08/17) for convection north of Cochrane. They were airborne at 0302Z (08/17). HS3 started patrolling the Didsbury area at 0317Z (08/17). At 0339Z (08/17) the crew started top seeding storm #3 for Calgary. The flight then stopped seeding and started patrolling for Calgary at 0354Z (08/17). They stopped patrolling and RTB at 0356Z (08/17), and the flight landed at 0416Z (08/17).</p> <p>HS5 was launched to convection NW of Calgary at 0302Z (08/17). The flight became airborne at 0328Z (08/17). At 0332Z (08/17) HS5 started base seeding storm #3 for Calgary. They then stopped seeding and started patrolling for Calgary at 0342Z (08/17). At 0352Z (08/17) the aircraft stopped patrolling</p> |
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| | | <p>and RTB. They landed at 0358Z (08/17).</p> <p>HS2 flew a reposition flight. The aircraft was airborne out of YQF at 0348Z (08/17) and landed in YBW at 0417Z (08/17).</p> <p>Flight Summary HS5: 1733Z-1802Z; no seeding; PR flight; takeoff YBW, land EA3. HS4: 0000Z-0105Z (08/17); no seeding; patrol Innisfail. HS5: 0001Z-0253Z (08/17); 269 EJ, 17 BIP; #1 Innisfail, #2 Sundre to Didsbury; takeoff EA3, land YBW. HS2: 0029Z-0254Z (08/17); 194 min wing-tip generators; 24 BIP; #2 Sundre to Didsbury; takeoff YBW, land YQF. HS1: 0206Z-0350Z (08/17); 276 EJ, 5 BIP; #3 Calgary. HS4: 0212Z-0424Z (08/17); 136 min wing-tip generators, 9 BIP; #3 Calgary. HS3: 0254Z-0422Z (08/17); 65 EJ, 0 BIP; #3 Calgary, patrol Didsbury. HS5: 0321Z-0402Z (08/17); 0 EJ, 2 BIP; #3 Calgary. HS2: 0344Z-0421Z (08/17); no seeding; reposition flight; takeoff YQF, land YBW.</p> |
| <p>August 17, Wednesday</p> | <p>An upper level trough was observed over northeast Alberta and Saskatchewan. Cooler and drier air surface air was predicted to advect through the project area through the forecast period, stabilizing the thermodynamic profile. A stronger convective threat was projected in the far southern project area and buffer, but was not expected to become a hail threat for the project area. No convective threats were anticipated overnight.</p> <p>Weak showers and thundershowers gradually exited the northern and eastern project areas Wednesday morning, with broken clouds persisting through the day. Scattered weak showers developed across the southern and central project area Wednesday afternoon into Wednesday night, but no significant precipitation accumulation occurred. No hail threats were observed.</p> <p>Lightning was observed in the project area.</p> <p>No TITAN cells, 51.8 max dBz, 8.0 max VIL</p> <p>Tmax YC = 20.5C and no rainfall data. Tmax QF = 21.1C and a trace of rain. Tmax Radar = 20.2C and no rain.</p> | <p>No aircraft operations.</p> |
| <p>August 18, Thursday</p> | <p>A shortwave trough was forecast to dig south across the project area Thursday afternoon. PVA associated with this feature was expected to instigate embedded showers throughout the afternoon. Clearing skies were anticipated immediately following this disturbance, destabilizing the environment and exceeding the anomalously low convective temperature, leading to scattered discrete convection late in the afternoon. Lightning and a marginal hail threat were predicted with this activity. Instability was</p> | <p>No aircraft operations.</p> |

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| | <p>expected to wane with radiative cooling Thursday evening, with clear tranquil conditions forecast overnight.</p> <p>Widespread stratiform showers moved from north to south Thursday morning, exiting the project area in the early afternoon. Clearing skies followed this wave of activity, shortly followed by scattered air-mass thundershowers building from north to south across the project. Most convective cells remained weak, and beneath radar-indicated hail criteria, but two cells in the eastern buffer briefly produced radar-indicated pea size hail. Convective activity subsided around dusk, with clearing skies and scattered fog developing overnight.</p> <p>Max cell top: 6.9km, 58.3 max dBz, 23.8 max VIL</p> <p>Tmax YC = 17.9C and 0.4mm of rain. Tmax QF = 19.3C and a trace of rain. Tmax Radar = 18.5C and 3.0mm of rain.</p> | |
| <p>August 19, Friday</p> | <p>Sinking air beneath a stout shortwave ridge was forecast to create dry and hostile convective conditions through the forecast period. A strong jet streak was modeled to pass immediately north and east of the project, with the right exit region residing over the project area Friday afternoon. Upper level clouds associated with this disturbance were expected to drift across the project area, but no convective hazards were forecast. Isolated weak showers were projected overnight, with marginal dynamic lift from the passing jet streak.</p> <p>High cirrus drifted across the project area Friday afternoon. No significant meteorological echoes were observed. Mostly clear skies were observed overnight.</p> <p>Max cell top: 14.4 max dBz</p> <p>Tmax YC = 21.3C and no rain. Tmax QF = 21.9C and no rain. Tmax Radar = 21.3C and no rain.</p> | <p>No aircraft operations.</p> |
| <p>August 20, Saturday</p> | <p>A broad upper level ridge was modeled to remain across southern Alberta. A significant cap associated with this feature was forecast to inhibit all surface based convection through the period. A subtle wave of vorticity responsible for mid-level clouds and virga Saturday morning was modeled to quickly exit the region, with mostly clear skies expected the remainder of the day. Stable convective conditions were anticipated to persist overnight, though a weak disturbance passing to the north was forecast to bring mid-level clouds and the potential for a weak shower in the far northern project after dusk.</p> <p>Thick mid to upper level clouds moved east of the project area Saturday morning, with predominantly clear skies Saturday afternoon and night. No convective hazards were observed.</p> <p>No TITAN cells, 28.2 max dBz, 0.1 max VIL</p> <p>Tmax YC = 25.2C and no rain.</p> | <p>No aircraft operations.</p> |

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| | <p>Tmax QF = 25.8C and no rain. Tmax Radar = 25.3C and no rain.</p> | |
| <p>August 21, Sunday</p> | <p>An upper level ridge was expected to remain centered along the AB/SK border through around the time of peak heating. A closed upper level low was centered over the Alaskan panhandle in the morning. This low was predicted to quickly move eastward and would begin to push into AB during the late overnight hours. 500mb temperatures were expected to cool dramatically during the overnight hours. Strong PVA also looked to occur during the overnight hours. A 700mb thermal ridge was expected to remain in place across the entire area through the early evening. The 21Z and 00Z (08/22) modified model soundings for CYQF show a loaded gun situation in place across the far northern part of the protected area during the afternoon and early evening.</p> <p>Cirrus and fair weather cumulus clouds were observed over the northern half of the project area through the early evening hours. Convection was minimal throughout the daytime hours due to a moderately strong cap in place over the entire project area. During the early nighttime hours an isolated thunderstorm developed east of Ponoka and slide northeastward. Towards the end of the period several thunderstorms formed along the northern foothills. These elevated thunderstorms quickly tracked northeastward across the region during the late overnight hours. The thunderstorms then merged and became more linear at around the time of sunrise. Radar data indicated grape size hail may have fallen north of the town of Caroline.</p> <p>Max cell top: 9.1km, 60.3 max dBz, 42.4 max VIL</p> <p>Tmax YC = 27.3C and no rain. Tmax QF = 22.5C and 7.6mm of rain. Tmax Radar = 22.8C and no rain.</p> | <p>No aircraft operations.</p> |
| <p>August 22, Monday</p> | <p>The closed upper level low was forecasted to slide eastward over the region. Due to the low, PVA was expected to occur throughout the forecast period. 500mb temperatures looked to cool aloft through the early afternoon hours as the low passed overhead. At the low levels and surface, windy conditions appeared to persist throughout the period. Surface winds were predicted to be out of the northwest. Wind gusts appeared to be highest in the evening for areas closest to the foothills. The 2Z modified model sounding for CYYC indicated the atmosphere would contain enough instability for small hail during the afternoon hours.</p> <p>A line of thunderstorms pushed eastward across the project area during the morning hours. Stratiform rain showers then fell over the northern half of the region the rest of the morning into the afternoon hours. Discrete thunderstorms then developed near Calgary and slid eastward across the project area during the mid-afternoon. The entire region continued to experience stratiform rain showers and windy weather conditions for most of the period.</p> | <p>Radar tour #5 was conducted at the Olds-Didsbury airport and 26 people were in attendance.</p> <p>HS5 flew a PR flight. They were airborne out of YBW at 1634Z and landed in EA3 at 1651Z.</p> <p>HS5 flew a return PR flight. They were airborne out of EA3 at 2350Z and landed in YBW at 0007Z (08/23).</p> <p>Flight Summary HS5: 1626Z-1653Z; no seeding; PR flight; takeoff YBW, land EA3. HS5: 2343Z (08/22)-0009Z (08/23); no seeding; PR flight; takeoff EA3, land YBW.</p> |

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| | <p>Pea size was hail reported in northwest Calgary, Calgary International airport, Sundre, and in the town of Condor (near Rocky MH). Ice pellets with strong wind gusts were observed in Olds. Wind gusts up to 48.7kts were observed at the Olds-Didsbury airport.</p> <p>Max cell top: 9.1km, 57.6 max dBz, 27.3 max VIL</p> <p>Tmax YC = 18.3C and 4.2mm of rain. Tmax QF = 14.3C and 33.6mm of rain. Tmax Radar = 13.7C and 22.6mm of rain.</p> | |
| <p>August 23, Tuesday</p> | <p>The upper level low was centered over southwestern SK during the morning and was expected to continue slowly moving eastward during the day. PVA from the low looked to continue flowing over the region from the north. Low level and surface winds were forecasted to remain out of the north to northwest. Windy weather conditions were expected to persist at the surface through the afternoon. Wind speeds were then predicted to begin decreasing during the evening hours as the low pressure system over SK began to shift eastward. The air mass across the area looked to contain enough instability in the late afternoon and evening for isolated, weak short-lived thunderstorms. The best potential for thunderstorm activity appeared to be in the northern part of the project area.</p> <p>Stratiform rain showers fell over the area through the early afternoon. In the mid-afternoon the stratiform rain showers began to taper off, and the cloud cover started to become more convective in nature. This convection was out of the north and was fast moving. Scattered convective rain showers were observed over the region through the early nighttime hours. Overnight the cloud cover began to dissipate and clearing occurred across the entire area.</p> <p>No TITAN cells, 52.4 max dBz, 5.2 max VIL</p> <p>Tmax YC = 16.4C and a trace of rain. Tmax QF = 13.4C and 2.4mm of rain. Tmax Radar = 15.7C and 2.8mm of rain.</p> | <p>No aircraft operations.</p> |
| <p>August 24, Wednesday</p> | <p>A shortwave ridge of high pressure was expected to briefly slide southeastward across the region during the afternoon and evening. This ridge appeared to be short-lived, and a shortwave trough then looked to push southeastward across the area overnight. PVA appeared to be almost negligible during the daytime. Overnight PVA was forecasted to increase as the shortwave approached the area from the NW. At the surface, a weak cool front was expected to push southeastward across the area during the late overnight hours. Area modified model soundings showed a moderately unstable air mass in place across the area during the forecast period.</p> <p>Isolated, light convective rain showers fell over the region during the afternoon and evening. During the nighttime hours the cloud cover began to thicken as a shortwave trough started to approach the area from the northwest.</p> | <p>No aircraft operations.</p> |

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| | <p>Convective rain showers started falling over the northern part of the region during late overnight hours. A single elevated thunderstorm developed north of Rocky MH during the late overnight hours. This thunderstorm was short-lived and produced rain showers as it moved southward.</p> <p>Max cell top: 6.1km, 53.9 max dBz, 13.7 max VIL</p> <p>Tmax YC = 19.5C and no rain. Tmax QF = 20.2C and 4.4mm of rain. Tmax Radar = 19.3C and no rain.</p> | |
| <p>August 25, Thursday</p> | <p>An 85kt northwesterly jet streak was expected to be positioned over western AB during the afternoon. A shortwave trough was centered over the area during the morning. This trough was expected to continue sliding southeastward during the afternoon hours. The region was forecasted to continue experiencing PVA from the trough through the afternoon. Low level and surface winds looked to mainly be out of the northwest. Area modified model soundings were indicating the troposphere would contain a moderate amount of instability during the afternoon. In the late afternoon the troposphere appeared to begin gradually stabilizing. 0 to 6km bulk speed shear values looked to be around 15kts.</p> <p>Scattered short-lived thunderstorms formed over the northwestern part of the region in the early morning. This convection then weakened as it pushed southward during the rest of the morning. In the afternoon scattered, weak and short-lived thunderstorms were observed over the entire region. Radar data indicated pea size hail may have fallen to the southwest of Eckville. The convection then diminished in the evening and mostly clear skies occurred overnight.</p> <p>Pea size hail was reported in southeast Calgary and Okotoks.</p> <p>Max cell top: 7.6km, 59.5 max dBz, 25.8 max VIL</p> <p>Tmax YC = 18.7C and 2.0mm of rain. Tmax QF = 17.9C and 8.0mm of rain. Tmax Radar = 16.4C and 2.3mm of rain.</p> | <p>No aircraft operations.</p> |
| <p>August 26, Friday</p> | <p>A shortwave trough was expected to slide eastward across the region in the evening. 500mb temperatures were predicted to warm by approximately 4.5C. PVA was expected starting in the evening and lasting into the overnight hours. The low level wind flow looked to be westerly to southwesterly over the foothills, so upslope conditions appeared unlikely throughout the period. At the surface, a lee trough was forecasted to form over the area during the daytime hours. Modified model soundings for the afternoon, evening, and overnight showed a troposphere that was only slightly unstable.</p> <p>Cirrus, cirrostratus, and altocumulus clouds were observed through the afternoon hours. The cloud cover then began to thicken in the evening. Isolated, light stratiform rain showers were then observed near Three</p> | <p>Radar tour #6 was conducted at the Olds-Didsbury airport and 23 people were in attendance.</p> <p>HS2 flew a PR flight. They were airborne out of YBW at 1730Z and landed in EA3 at 1748Z.</p> <p>HS2 flew a return PR flight. They were airborne out of EA3 at 2304Z and landed in YBW at 2321Z.</p> <p>Flight Summary HS2: 1717Z-1750Z; no seeding; PR flight; takeoff YBW, land EA3. HS2: 2259Z-2324Z; no seeding; PR flight; takeoff EA3, land YBW.</p> |

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| | <p>Hills overnight.</p> <p>No TITAN cells, 41.0 max dBz, 1.2 max VIL</p> <p>Tmax YC = 20.5C and a trace of rain. Tmax QF = 20.7C and a trace of rain. Tmax Radar = 20.2C and no rain.</p> | |
| <p>August 27, Saturday</p> | <p>Southwesterly upper level jet energy was predicted to occur over AB. A closed upper level low was centered near the Grande Prairie area in the morning. This low was expected to slowly track eastward and looked to be positioned near Edmonton overnight. Due to the jet energy and low, PVA appeared to be abundant throughout the period. A cold front was forecasted to slide southeastward into the northern part of the project area starting in the late afternoon. The front was expected to continue pushing southeastward across the region during the evening hours. The northern project area looked to see close to 1000J/kg of CAPE during the time of peak heating along with strong speed shear.</p> <p>Scattered stratiform rain showers fell over the region in the morning. During the afternoon hours, a cold front slid southeastward across the region. This front triggered convection near the Red Deer area. The strongest storm of the day formed north of Three Hills in the eastern buffer zone. This thunderstorm tracked eastward out of the area and was not a hail threat to any population centers. Radar data indicated pea size hail may have fallen to the north of Three Hills.</p> <p>Max cell top: 9.1km, 56.6 max dBz, 23.8 max VIL</p> <p>Tmax YC = 24.1C and 1.6mm of rain. Tmax QF = 21.4C and 5.8mm of rain. Tmax Radar = 24.0C and 1.5mm of rain.</p> | <p>No aircraft operations.</p> |
| <p>August 28, Sunday</p> | <p>A modest westerly jet was in place over southern AB. It was shifting to the north as a ridge amplified over the region. Cold dry northerly winds were expected throughout the day which would keep a cool stable air mass over the region throughout the period. Winds were expected to eventually shift to the southeast late in the period with no significant impact. Low thin broken stratus was forecast for most of the day. Very weak isolated stratiform showers were expected early in the period, ending by midday.</p> <p>A thin stratus layer was observed throughout most of the period. Some very light rain showers were observed in the morning and early afternoon. There was no convection.</p> <p>No TITAN cells, 40.5 max dBz</p> <p>Tmax YC = 14.1C and at trace of rain. Tmax QF = 14C and no rain. Tmax Radar = 13C and no rain.</p> | <p>No aircraft operations.</p> |
| <p>August 29, Monday</p> | <p>No significant upper jet energy was in place over the project region. A large midlevel trough was well-</p> | <p>No aircraft operations.</p> |

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| | <p>established over the region. Weak elevated instability was expected throughout the period, but only a few hundred CAPE. Convective inhibition was very strong, at least - 200 J/Kg. A late afternoon shortwave was expected to push through around 00z-03z creating some rain showers in the southern project region. No hail threats were forecast as any echoes moving into the region would likely be dissipating and only remnants or dissipating cells were expected to survive within the project boundaries.</p> <p>Light stratus rain was observed in Springbank in the morning hours, but it dissipated by briefing time. Some weak unorganized convection formed along the foothills late in the day which moved through the southern half of the project region as elevated cells producing a few lightning strikes. There were no hail threats.</p> <p>Max cell top: 8.4km, 55.7 max dBz, 19.7 max VIL</p> <p>Tmax YC = 23.6C and a trace of rain. Tmax QF = 21.1C and no rain. Tmax Radar = 21.4C and no rain.</p> | |
| <p>August 30, Tuesday</p> | <p>Upper level jet energy was forecast over AB. The first wave of PVA looked to begin pushing into the area from the southwest in the early evening. A shortwave trough was predicted to slide northeastward across the region during the nighttime hours. Strong southeast moisture advection was expected throughout the period which would aid in keeping the troposphere unstable through the overnight. Thermodynamic profiles for the region showed a loaded gun situation during the daytime. A strong cap was expected to be in place throughout the period. Model soundings for the overnight hours showed a fairly unstable troposphere remaining in place through at least 09Z. Speed shear appeared to be sufficient for long-lived TS.</p> <p>During the late afternoon, a thunderstorm developed over the foothills west of Cochrane. This storm moved northeastward and then dissipated as it tried to push off the foothills. In the evening a taller thunderstorm formed near Limestone mountain. This storm tracked northward and stayed along the foothills. During the nighttime hours, a line of elevated fast moving thunderstorms slid northward across the entire project area. This line of thunderstorms mainly produced rain showers and lightning. Radar data suggested pea size hail may have fallen to the north of Rocky MH.</p> <p>Max cell top: 9.1km, 56.0 max dBz, 23.8 max VIL</p> <p>Tmax YC = 26.3C and no rain. Tmax QF = 24.7C and 0.4mm of rain. Tmax Radar = 24.6C and no rain.</p> | <p>No aircraft operations.</p> |
| <p>August 31, Wednesday</p> | <p>An 80 knot jet streak was predicted to nose its way into the area at roughly the time of peak heating. A shortwave trough was poised to begin pushing into the far southern part of the project area at around 00Z (09/01). At the low levels, warm moist air looked to continue being advected into the region from the southeast through the overnight</p> | <p>HS1 was launched at 0042Z (09/01) to a tall storm developing north of Cochrane. The flight became airborne at 0108Z (09/01). At 0123Z (09/01) HS1 started top seeding storm #1 for Didsbury. The aircraft continued seeding the storm as it moved north-northeastward toward</p> |

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| | <p>hours. The surface wind flow looked to remain southeasterly through the evening which would produce upslope conditions across the area. Weak lee cyclogenesis was expected to occur near the Rocky MH area at around the time of sunset. Model soundings showed a loaded gun situation with strong enough speed shear for long-lived severe thunderstorms. 0 to 6km bulk shear values appeared to be around 50kts.</p> <p>Starting around 00Z (09/01) convection started forming near the Cochrane area. Explosive convective growth then occurred north of Cochrane. This convection grew into an elevated storm (#1) which tracked north-northeastward along the QE2 highway during the evening hours. Radar data indicated grape size hail may have fallen southeast of Red Deer. During the early nighttime hours, the thunderstorm activity shifted to the northeast of the project area.</p> <p>Pea size hail was observed at the Olds-Didsbury airport at 0132Z (09/01). Pea size hail occurred in Olds.</p> <p>Max cell top: 12.9 km, 58.8 max dBz, 38.4 max VIL</p> <p>Tmax YC = 27C and a trace of rain. Tmax QF = 25.8C and 4.6mm of rain. Tmax Radar = 25C and 12mm of rain.</p> | <p>Ponoka. The aircraft then stopped seeding and RTB at 0249Z (09/01). They landed at 0317Z (09/01).</p> <p>HS2 was launched to a tall storm north of Cochrane at 0047Z (09/01). The aircraft was airborne at 0110Z (09/01). At 0131Z (09/01) HS2 started base seeding storm #1 for Olds. The crew continued seeding this elevated storm as it pushed north-northeastward toward Ponoka. Then at 0249Z (09/01) HS2 stopped seeding and RTB. The aircraft landed at 0324Z (09/01).</p> <p>HS4 was launched at 0104Z (09/01) to a growing storm moving toward Didsbury and Olds. They were airborne at 0130Z (09/01). The crew started base seeding storm #1 for Innisfail at 0152Z (09/01). They remained with the same storm and continued seeding as it moved north-northeastward along the QE2 highway. At 0250Z (09/01) HS4 stopped seeding and RTB. The flight landed at 0315Z (09/01).</p> <p>Flight Summary HS1: 0100Z-0320Z (09/01); 22 EJ, 13 BIP; #1 Didsbury to Ponoka. HS2: 0057Z-0329Z (09/01); 154 minutes wing-tip generators, 12 BIP; #1 Olds to Ponoka. HS4: 0122Z-0320Z (09/01); 116 minutes wing-tip generators, 5 BIP; #1 Innisfail to Ponoka.</p> |
| <p>September 1, Thursday</p> | <p>A large scale low pressure system was approaching from the west. Strong curvature vorticity would be moving through during the late night hours, which was expected to create widespread rain over the area. The atmosphere was mainly stable across the project area during the day. Some weak shallow instability was expected overnight. With shallow nocturnal elevated instability and intense vorticity advection overnight, some embedded thunderstorms were forecast overnight. A few isolated rain showers were expected early in the period. There were no hail threats forecast.</p> <p>Light rain showers developed in the northwestern project area in the midafternoon. Some weak convection was observed in the western project region during the late afternoon, but cells were not a hail threat. Stratiform rain continued throughout the evening and overnight hours across most of the project.</p> <p>Max cell top: 7.6km, 55.9 max dBz, 20.5 max VIL</p> <p>Tmax YC = 25.7C and no rain. Tmax QF = 22.4C and 0.2mm of rain. Tmax Radar = 27C and 8.4mm of rain.</p> | <p>Radar tour #7 was conducted at the Olds-Didsbury airport and 25 people were in attendance.</p> <p>HS4 flew a PR flight to EA3 for a radar tour. They were airborne at 1635Z from YQF and landed in EA3 at 1653Z.</p> <p>HS4 flew a PR flight returning home from the radar tour. They were airborne at 0021Z (08/02) from EA3 and landed back in YQF at 0035 (08/02).</p> <p>Flight Summary HS4: 1620Z-1656Z; no seeding; PR flight from YQF to EA3. HS4: 0014Z (08/02)- 0040Z (08/02); no seeding; PR flight from EA3 to YQF.</p> |
| <p>September 2, Friday</p> | <p>A southwesterly jet was in place over far southern AB. A large low pressure system was over BC, slowly approaching AB. A potent lobe of vorticity was expected to move through the south and central part of the project</p> | <p>No aircraft operations.</p> |

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| | <p>area during the early afternoon around 21z. Weak instability was forecast during the early afternoon between 18z and 21z, and then rapid stabilization was expected by midafternoon. CAPE values around 300 J/kg were forecast, and surface dew points were expected to drop sharply throughout the afternoon. Temperatures were expected to remain cool, and convective cloud bases would be near freezing.</p> <p>Stratus rain occurred in the northwest project area during the morning. In the early afternoon, weak convection pushed through the central and southern project area. However, one cell developed into an intense low topped organized cell which moved through Calgary. There were numerous hail reports from across Calgary. Most of the hail was pea size with a few isolated reports of nickel hail. After 22z, the atmosphere stabilized rapidly behind the vorticity lobe, and only rain showers were observed through the rest of the afternoon. Echoes cleared out in the early evening.</p> <p>Max cell top:8.4 km, 58.7 max dBz, 31.4 max VIL</p> <p>Tmax YC = 14.8C and 3mm of rain. Tmax QF = 13.2C and 6.8mm of rain. Tmax Radar = 13C and no rain.</p> | |
| <p>September 3, Saturday</p> | <p>A deep low pressure system was centered over AB which would remain over the region through the next few days developing into an open wave trough. Several lobes of weak vorticity were expected to push southeastward into the area late in the day. Weak afternoon instability was expected project-wide with highest CAPE values in the south around mid-afternoon reaching 600 J/kg. Wind shear was very weak, and convective cloud bases were near freezing. Some short-lived popup convection was forecast during the afternoon, but no damaging hail was expected.</p> <p>Several unorganized cells moved across the western project boundary in the afternoon with some lightning and TITAN cell tops to 8.4 km briefly. They dissipated quickly and were not a threat to any cities. Some stratiform rain showers were observed during the late night hours under stable atmospheric conditions.</p> <p>Max cell top: 8.4km, 57.5 max dBz, 26.8 max VIL</p> <p>Tmax YC = 18.3C and a trace of rain Tmax QF = 16.3C and 1.2mm of rain. Tmax Radar = 17C and 1.5mm of rain.</p> | <p>No aircraft operations.</p> |
| <p>September 4, Sunday</p> | <p>A deep, high amplitude upper trough was lingering over the region. Scattered stratus rain showers were expected in the early morning hours, but they would dissipate by late morning. The atmosphere would be stable throughout the period with no threat of convection. Some weak CAPE was likely over the foothills with weak convective showers expected well west of the project boundary during the day and evening hours. Low stratus clouds were expected throughout the majority of the period. Cold surface temps and low dew points were likely with a</p> | <p>No aircraft operations.</p> |

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| | <p>chance of frost overnight.</p> <p>Very early in the forecast period, some weak rain showers were observed across the southern project area. There were some echoes near Vulcan that reached 30 dBz rain showers briefly, but the majority of the early morning echoes were mist or virga. Low stratus blanketed the area throughout the day. Convective showers developed far to the west over the foothills, but they remained nearly stationary and did not reach the western project boundary. There were no hail threats and no convection in the project area. The radar was clear overnight.</p> <p>No TITAN cells, 31 max dBz</p> <p>Tmax YC = 11.5C and 0.2mm rain. Tmax QF = 9.9C and no rain. Tmax Radar = 10C and no rain.</p> | |
| <p>September 5, Monday</p> | <p>A large upper level trough was in place over the region with a cold air mass in place. Dew points were in the upper single digits. Several waves of midlevel vorticity were expected during the day, and then a stronger wave would move through the northern project area just after 00z. Instability was marginal, around 500 J/kg, and speed shear was weak. Light upslope flow was expected during the day. Weak convection was expected to move off the foothills into the project area during the afternoon, followed by a wave of stronger convection after 00Z in the north.</p> <p>At roughly 23Z a cluster of TITAN cells (storm #1) formed west of Innisfail and pushed northeastward through the Red Deer area. The second seeded storm of the day formed over the northern foothills near the town of Nordegg in the late afternoon. This long-lived thunderstorm eventually slid through the Rocky MH area in the evening. Radar data indicated grape size hail may have fallen to the north of Rocky MH.</p> <p>Pea size hail reported in Olds and northeast Calgary.</p> <p>Max cell top: 8.4km, 58.7 max dBz, 33.3 max VIL</p> <p>Tmax YC = 17.6C and 4.0mm of rain. Tmax QF = 15.2C and 0.4mm of rain. Tmax Radar = 15.9C and 2.0mm of rain.</p> | <p>HS3 was launched at 2329Z to a cluster of TITAN cells moving toward Red Deer. The aircraft became airborne at 2344Z. HS3 started top seeding storm #1 for Red Deer at 2356Z. Then at 0020Z (09/06) they stopped seeding and started patrolling while the aircraft flew from Red Deer to the Olds area. At 0050Z (09/06) HS3 was redirected to the Rocky MH area. The aircraft began patrolling the Rocky MH region at 0105Z (09/06). At 0118Z (09/06) the crew started top seeding storm #2 for Rocky MH. Shortly after they started top seeding, they continued seeding while they descended to the base seeding altitude. HS3 started base seeding storm #2 for Rocky MH at 0125Z (09/06). At 0157Z (09/06) the aircraft stopped seeding and started patrolling Eckville. They then stopped patrolling and RTB at 0207Z (09/06). The flight landed at 0224Z (09/06).</p> <p>Flight Summary HS3: 2336Z (09/05)-0230Z (09/06); 72 EJ, 14 BIP; #1 Red Deer; patrol Olds; #2 Rocky MH, patrol Eckville.</p> |
| <p>September 6, Tuesday</p> | <p>A long wave mid and upper level trough was predicted to remain in place over the western part of North America. At roughly the time of peak heating a shortwave trough, with moderately strong PVA, was expected to slide eastward across the region. Low level winds looked to be mainly out of the east to southeast which would favor upslope conditions. Weak lee cyclogenesis was forecasted to occur over the southern part of the project area. The 21Z and 00Z (09/07) modified model soundings for CYQF and CYYC showed a moderately unstable troposphere with CAPE values ranging from 200 to 500J/kg. 0 to 6km bulk speed shear values appeared to be adequate enough for long-lived thunderstorms.</p> | <p>No aircraft operations.</p> |

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| | <p>Convection initiated along the foothills to the west of Sundre in the early afternoon. During the rest of the afternoon this convection drifted into the region and a few short-lived thunderstorms were observed northwest of Airdrie. Starting at approximately 00Z (09/07) an isolated TITAN cell grew near Bragg Creek. This longer lived thunderstorm then slid southeastward through Turner Valley and Black Diamond during the evening hours. Radar data suggested pea size hail may have fallen to the north of Turner Valley. This storm dissipated before reaching High River. The scattered convective rain showers over the entire region then diminished starting around the time of sunset.</p> <p>Max cell top: 6.9km, 58.1 max dBz, 21.2 max VIL</p> <p>Tmax YC = 15.7C and 0.2mm of rain. Tmax QF = 16.3C and no rain. Tmax Radar = 14.7C and 1.0mm of rain.</p> | |
| <p>September 7, Wednesday</p> | <p>Upper level jet energy was expected to remain south of the area. A wave of weak PVA looked to pass eastward over the region in the afternoon. Low level wind flow appeared to be mainly out of the west to southwest which would mean most of the region would likely see down slope weather conditions in the afternoon. Dew points looked to be higher over the eastern half of the project area during the daytime. Due to temperatures remaining cold aloft, the air mass looked to be unstable enough for thunderstorms in the afternoon and evening. 0 to 6km bulk speed shear values appeared to range from 20 to 30kts across the area.</p> <p>Towering cumulus clouds began forming along the foothills in the late morning. In the afternoon and evening scattered convective rain shower showers fell over the area. Slightly heavier convective rain showers were observed on radar to the west of Carstairs during the mid-afternoon. Overnight, stratiform clouds began to thicken over the region.</p> <p>Max cell top: 5.4km, 51.6 max dBz, 7.4 max VIL</p> <p>Tmax YC = 19.6C and no rain. Tmax QF = 18.5C and 0.8mm of rain. Tmax Radar = 17.9C and no rain.</p> | <p>No aircraft operations.</p> |
| <p>September 8, Thursday</p> | <p>An upper level trough was along the AB/BC border during the morning hours and was expected to continue sliding towards the southeast. In the afternoon a shortwave trough was forecasted to follow behind the trough with a similar trajectory. Moderately strong PVA looked to occur with the shortwave. The wind flow was predicted to be mostly out of the northwest, so upslope conditions appeared to be minimal. Surface pressure values were expected to rise steadily throughout the forecast period. The CYQF and CYYC modified model soundings showed a thermodynamic profile with a moderate amount of instability from mid-afternoon through early evening. 0 to 6km bulk speed shear values appeared to be fairly weak, approximately 5kts.</p> | <p>No aircraft operations.</p> |

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| | <p>Stratiform rain showers fell over the area during the morning. In the early afternoon thunderstorms developed over the foothills to the west of Sundre and Cremona. These TITANs cells moved southeastward into the area and eventually tracked through the cities of Cochrane and Calgary during the mid-afternoon. In the late afternoon the low-top thunderstorm activity continued to the south of Calgary. The convection then dissipated across the entire protected area during the evening, and no significant weather was observed overnight.</p> <p>Pea size hail reported in Calgary and Cochrane.</p> <p>Max cell top: 8.4km, 56.2 max dBz, 22.6 max VIL</p> <p>Tmax YC = 15.1C and 3.3mm of rain. Tmax QF = 12.5C and 3.0mm of rain. Tmax Radar = 12.7C and 0.3mm of rain.</p> | |
| <p>September 9, Friday</p> | <p>A ridge of high pressure looked to briefly build over AB through the evening. The ridge then appeared to flatten overnight as it shifted into SK as a trough began to slide southeastward over northern BC. 500mb temperatures were predicted to warm significantly (~7C) which would act to stabilize the troposphere. A shortwave trough was expected to slide eastward across the area overnight with moderate PVA. The 21Z modified model soundings for CYYC and CYQF showed an instability layer extending up to roughly 16,000ft MSL. The troposphere also looked to be fairly dry above 10,000ft MSL, so any convection that did potentially form was expected to encounter dry air entrainment.</p> <p>Alto cumulus standing lenticular, altostratus, fair weather cumulus, and cirrus clouds formed over the region off and on throughout the period. No precipitation echoes were observed on radar.</p> <p>No TITAN cells, 24.5 max dBz, 0.4 max VIL</p> <p>Tmax YC = 18.6C and no rain. Tmax QF = 18.2C and no rain. Tmax Radar = 18.3C and no rain.</p> | <p>No aircraft operations.</p> |
| <p>September 10, Saturday</p> | <p>An 110kt upper level jet streak was forecasted to nose its way into the area starting in the late afternoon. A trough was positioned over northern BC and PVA associated with this wave of low pressure was expected to begin pushing into the region in the late afternoon. The main trigger for TS looked to be a cold front which will begin to move into the northwest part of the project area in the late afternoon or early evening. This front was predicted to then slide southeastward across the area in the evening and early nighttime hours. Area modified model soundings showed that thunderstorms would likely struggle to become larger than 7km MSL. None the less, speed shear appeared to be around 50kts which will be sufficient for long-lived TS.</p> <p>Widespread stratus rain pushed southward into the project area late in the afternoon with the cold front.</p> | <p>No aircraft operations.</p> |

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| | <p>There were several shallow weak convective showers in the northern project area, but they were not hail threats. The tallest convective thundershower was over the Blackfalds area which produced a few lightning strikes for a brief time. Rain continued through the evening and overnight hours.</p> <p>Max cell top: 5.4km, 56.7 max dBz, 14.4 max VIL</p> <p>Tmax YC = 22.2C and no rain. Tmax QF = 21.8C and 3.8mm of rain. Tmax Radar = 22.3C and 5.6mm of rain.</p> | |
| <p>September 11, Sunday</p> | <p>The upper level jet was now south of the project region digging into the US Rockies. The trough was expected to develop into a cutoff low over the US in the next 36 hours. A strong NE upper jet would be over the project region by morning. An unseasonably cool air mass was in place over the region with dew points expected to be in the low single digits or even near zero degrees. Stable conditions were likely for most of the period, with a bit of very weak CAPE in the midafternoon (less than 100 J/kg). Stratus rain was likely in the morning and afternoon. Cloudy skies were likely throughout the period along with strong northerly surface winds.</p> <p>Widespread stratus rain pushed through the southern project area during the morning and early afternoon. During the mid to late afternoon, some very weak shallow convection developed. There were no lightning strikes, only some short-lived showers. Some very light stratus rain returned in the evening, and then there were no significant echoes observed overnight.</p> <p>No TITAN cells, 44.6 max dBz</p> <p>Tmax YC = 9.9C and 10.2mm of rain. Tmax QF = 9.8C and 2.0mm of rain. Tmax Radar = 9.0C and 4.8mm of rain.</p> | <p>No aircraft operations.</p> |
| <p>September 12, Monday</p> | <p>A northeasterly upper jet was forecast to drift eastward through the project area during the day as a cutoff low was developing far to the south. There was no significant vorticity advection expected. Model soundings indicated a strong midlevel cap at 700mb with some shallow low level CAPE likely during the afternoon. Deep convection was not expected. Fair weather cumulus was anticipated to gradually diminish throughout the day, and then clear skies were likely after sunset.</p> <p>Broken low clouds were in place for much of the afternoon, becoming scattered late in the day. Skies eventually cleared by evening, and then clear skies were observed overnight. There were no significant radar echoes, other than some ice crystals. No deep convection occurred, and there were no hail threats or precipitation.</p> <p>No TITAN cells, 13.1 max dBz</p> <p>Tmax YC = 12.2C and 0.2mm of rain. Tmax QF = 12.6C and no rain. Tmax Radar = 12.8C and 0.3mm of rain.</p> | <p>HS1 flew a maintenance flight. The aircraft was airborne at 1734Z and landed at 1741Z.</p> <p>Flight Summary HS1: 1720Z-1743Z; no seeding; maintenance flight.</p> |

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| <p>September 13, Tuesday</p> | <p>An upper level ridge of high pressure was over BC and AB in the morning. This ridge was expected to flatten during the daytime hours. The wind flow looked to become more zonal late in the forecast period. A weak wave of PVA was forecasted to move southeastward across the area during the late afternoon hours, but this disturbance looked to only produce scattered mid-level cloud cover. At the low levels a very strong cap was predicted to be in place over the entire area throughout the forecast period. Modified model soundings for the region indicated the troposphere would be stable throughout the day and night.</p> <p>Mostly clear skies were observed across the entire project area throughout the day and night.</p> <p>No TITAN cells or discernible meteorological echoes.</p> <p>Tmax YC = 19.1C and no rain. Tmax QF = 20.5C and no rain. Tmax Radar = 20.1C and no rain.</p> | <p>No aircraft operations.</p> |
| <p>September 14, Wednesday</p> | <p>The upper level jet stream was forecast to remain north of the region. The area looked to see zonal flow at the mid-levels. At the low levels and surface the diurnal mountain plains circulation was expected to set up during the daytime allowing for weak upslope wind flow. The CYQF modified model soundings suggested the area would be slightly unstable from the evening through overnight hours. CAPE values looked to approach 100J/kg in the evening and overnight. 0 to 6km bulk speed shear values were expected to be fairly weak.</p> <p>Scattered cirrus and altocumulus clouds flowed over the area during the daytime and overnight hours.</p> <p>No TITAN cells, 23.5 max dBz, 0.2 max VIL</p> <p>Tmax YC = 22.9C and no rain. Tmax QF = 24.4C and no rain. Tmax Radar = 23.4C and no rain.</p> | <p>No aircraft operations.</p> |
| <p>September 15, Thursday</p> | <p>The upper level jet stream looked to remain north of the area. At the mid-levels the wind flow was expected to be out of the west to northwest. A lee trough looked to form in the late afternoon and would shift eastward in the evening. Modified model soundings for the region showed a cap in place through the early afternoon hours. This cap was expected to erode over the southern half of the project area during the mid-afternoon hours giving way to isolated convection along the foothills. Enough instability was predicted to be present for short-lived thunderstorms. Bulk speed shear values looked to be weak, approximately 10kts.</p> <p>In the late afternoon a few isolated towering cumulus clouds formed along the foothills to the west and southwest of Calgary. These towering cumulus clouds produced isolated rain showers as they pushed into the protected area. This convection was short-lived and dissipated during the early evening hours.</p> | <p>No aircraft operations.</p> |

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| | No TITAN cells. Tmax YC = 22.7C and no rain. Tmax QF = 22.9C and no rain. Tmax Radar = 21.7C and no rain. | |
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APPENDIX C – AIRCRAFT OPERATIONS SUMMARY TABLE

| Air Time | | | | | |
|------------------|-------|-------|-------|-------|-------|
| | HS1 | HS2 | HS3 | HS4 | HS5 |
| JUNE | 8:21 | 20:06 | 13:04 | 12:52 | 17:07 |
| JULY | 29:12 | 27:52 | 20:24 | 19:07 | 24:27 |
| AUGUST | 12:05 | 18:49 | 5:54 | 9:30 | 8:31 |
| SEPTEMBER | 0:00 | 0:00 | 2:40 | 0:00 | 0:00 |

| STORM DAY | HAILSTOP 1 Beech King Air C90 | | | HAILSTOP 2 Cessna 340A | | | | HAILSTOP 3 Beech King Air C90 | | | HAILSTOP 4 Cessna 340A | | | | HAILSTOP 5 Beech King Air C90 | | | DAILY TOTALS | |
|------------------|----------------------------------|-----------|------------|---------------------------|-----------|--------|----------|----------------------------------|-----------|------------|---------------------------|-----------|------------|----------|----------------------------------|-----------|------------|---------------|-------------------|
| | Flight Time | EJ Flares | BIP Flares | Flight Time | EJ Flares | Flares | Gen Time | Flight Time | EJ Flares | BIP Flares | Flight Time | EJ Flares | BIP Flares | Gen Time | Flight Time | EJ Flares | BIP Flares | No. of Storms | Daily Agl (grams) |
| JUNE | | | | | | | | | | | | | | | | | | | |
| 7-Jun | 3:35 | 124 | 3 | 3:23 | | 22 | 175 | 2:23 | 66 | 24 | 2:30 | | 5 | 182 | 2:14 | 173 | 7 | 5 | 17,134 |
| 8-Jun | | | | 2:13 | | 4 | 104 | | | | | | | | 2:27 | 67 | 1 | 3 | 2,301 |
| 9-Jun | | | | | | | | 1:57 | 101 | 12 | | | | | | | | 1 | 3,820 |
| 21-Jun | | | | 2:24 | | | 124 | | | | | | | | 2:22 | 50 | 3 | 3 | 1,701 |
| 22-Jun | | | | | | | | 0:34 | 69 | 3 | | | | | | | | 1 | 1,830 |
| 23-Jun | 0:51 | 23 | | 3:38 | | 12 | 105 | 1:55 | 75 | 12 | 3:04 | | 14 | 198 | | | | 3 | 8,274 |
| 24-Jun | | | | 2:01 | | 4 | 208 | | | | | | | | 1:23 | | 2 | 3 | 1,322 |
| 25-Jun | 1:07 | | | | | | | 0:19 | | | | | | | | | | 0 | 0 |
| 28-Jun | 2:48 | 297 | 12 | 2:51 | | 21 | 276 | 3:09 | 145 | 26 | 3:38 | | 24 | 320 | 3:46 | 199 | 26 | 4 | 30,379 |
| 29-Jun | | | | | | | | | | | 0:25 | | | 26 | | | | 1 | 53 |
| 30-Jun | | | | 3:36 | | 13 | 250 | 2:47 | 18 | 4 | 3:15 | | 3 | 149 | 4:55 | 193 | 30 | 8 | 12,529 |
| JULY | | | | | | | | | | | | | | | | | | | |
| 1-Jul | | | | | | | | 2:43 | 247 | 15 | 1:35 | | 8 | 104 | | | | 2 | 8,601 |
| 2-Jul | 2:44 | 17 | 1 | 2:31 | | 4 | 196 | | | | 1:07 | | | | 2:31 | 87 | 6 | 2 | 4,127 |
| 3-Jul | 3:55 | 220 | 16 | 3:41 | | 12 | 186 | 3:04 | 290 | 6 | 4:23 | | 19 | 304 | 2:40 | | 27 | 6 | 23,194 |
| 4-Jul | 4:23 | 55 | 14 | 3:25 | | 3 | 246 | | | | 0:40 | | | 17 | | | | 3 | 4,183 |
| 9-Jul | 1:08 | 41 | 7 | 1:45 | | 17 | 188 | 0:17 | | | | | | | 3:41 | 108 | 14 | 2 | 9,061 |
| 12-Jul | | | | | | | | | | | | | | | 1:59 | 25 | 5 | 2 | 1,250 |
| 15-Jul | 0:45 | | | | | | | | | | | | | | | | | 0 | 0 |
| 18-Jul | 3:38 | 186 | 21 | 2:57 | | 15 | 302 | 0:30 | | | 0:47 | | | 28 | 3:58 | 91 | 20 | 3 | 14,609 |
| 22-Jul | | | | 1:22 | | | 60 | | | | | | | | 2:47 | 54 | 8 | 2 | 2,402 |
| 25-Jul | 1:28 | 29 | 9 | 1:37 | | 8 | 162 | 2:51 | 153 | 7 | 1:43 | | | | | | | 2 | 7,569 |
| 26-Jul | | | | 1:02 | | 6 | 94 | | | | 1:16 | | | 28 | 1:13 | 78 | 4 | 1 | 3,307 |
| 27-Jul | 2:24 | 32 | 13 | 2:15 | | 4 | 164 | 3:35 | 175 | 13 | 3:10 | | 10 | 220 | 0:10 | | | 5 | 10,919 |
| 28-Jul | 1:55 | 283 | 11 | 2:27 | | 23 | 234 | 2:53 | 122 | 8 | 1:09 | | 4 | 76 | 3:45 | | 26 | 3 | 19,529 |
| 30-Jul | 3:47 | 285 | 15 | 1:53 | | 22 | 204 | 3:18 | 114 | 13 | 3:17 | | 19 | 240 | 1:43 | 289 | 20 | 4 | 28,010 |
| 31-Jul | 3:05 | 258 | 18 | 2:57 | | 23 | 298 | 1:13 | | | | | | | | | | 1 | 11,914 |
| AUGUST | | | | | | | | | | | | | | | | | | | |
| 2-Aug | 2:32 | 19 | 4 | 1:50 | | 3 | 86 | | | | | | | | 1:34 | 96 | 3 | 4 | 3,974 |
| 5-Aug | | | | 1:11 | | | | | | | | | | | 0:30 | | | 0 | 0 |
| 6-Aug | 1:56 | 79 | 7 | 1:44 | | 12 | 166 | | | | | | | | | | | 1 | 4,767 |
| 8-Aug | | | | 1:15 | | 8 | 124 | 1:42 | 123 | | | | | | | | | 1 | 3,911 |
| 9-Aug | | | | 2:00 | | 7 | 150 | 2:11 | 154 | 7 | 3:12 | | 6 | 262 | 3:12 | 268 | 4 | 6 | 12,876 |
| 10-Aug | 1:05 | 38 | 1 | | | | | | | | 0:11 | | | | | | | 2 | 910 |
| 11-Aug | | | | 1:43 | | 7 | 160 | | | | | | | | | | | 1 | 1,374 |
| 13-Aug | | | | 1:45 | | 4 | 42 | 0:47 | | | 0:51 | | 4 | 48 | | | | 1 | 1,383 |
| 14-Aug | 2:51 | 176 | 13 | 2:53 | | 6 | 264 | | | | 1:08 | | 2 | 38 | | | | 4 | 7,282 |
| 16-Aug | 1:32 | 276 | 5 | 2:14 | | 24 | 194 | 1:14 | 65 | | 2:54 | | 9 | 136 | 3:15 | 269 | 19 | 3 | 21,419 |
| 31-Aug | 2:09 | 22 | 13 | 2:14 | | 12 | 154 | | | | 1:14 | | 5 | 116 | | | | 1 | 5,488 |
| SEPTEMBER | | | | | | | | | | | | | | | | | | | |
| 5-Sep | | | | | | | | 2:40 | 72 | 14 | | | | | | | | 2 | 3,540 |

Tables are seed and patrol only.

All flight times are AIR time, not engine time.

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|-----------|-----|-------|-------|------|-------|-------|------|-----|----|-----|--------|-------|-----|----|-----|-------|--|---|--------|---|----|----|
| 14-Aug-16 | HS2 | 21.08 | 0.12 | 3.04 | 21.17 | 0.10 | 2.53 | 0 | 0 | 264 | SEED | | | | | | | 0 | 257214 | 3 | AB | CA |
| 14-Aug-16 | HS1 | 21.09 | 0.09 | 3.00 | 21.15 | 0.06 | 2.51 | 176 | 13 | 0 | SEED | | | | | | | 0 | 257214 | 0 | FD | JE |
| 14-Aug-16 | HS4 | 21.11 | 21.46 | 0.35 | 21.19 | 21.44 | 0.25 | 0 | 0 | 0 | REPO | | | | | | | 0 | 257214 | 0 | JN | JF |
| 14-Aug-16 | HS5 | 21.55 | 22.26 | 0.31 | 22.07 | 22.24 | 0.17 | 0 | 0 | 0 | REPO | | | | | | | 0 | 257214 | 0 | BK | HK |
| 14-Aug-16 | HS4 | 22.13 | 23.26 | 1.15 | 22.18 | 23.26 | 1.08 | 0 | 2 | 38 | SEED | | | | | | | 0 | 257214 | 1 | JN | JF |
| 14-Aug-16 | HS5 | 23.59 | 0.27 | 0.28 | 0.05 | 0.23 | 0.18 | 0 | 0 | 0 | REPO | 7.19 | 176 | 21 | 302 | 7282 | | 0 | 264497 | 0 | BK | HK |
| 16-Aug-16 | HS5 | 17.33 | 18.02 | 0.29 | 17.44 | 18.00 | 0.16 | 0 | 0 | 0 | PR | | | | | | | 0 | 264497 | 0 | BK | JE |
| 17-Aug-16 | HS4 | 0.00 | 1.05 | 1.05 | 0.11 | 1.02 | 0.51 | 0 | 0 | 0 | PATROL | | | | | | | 0 | 264497 | 0 | JN | RO |
| 17-Aug-16 | HS5 | 0.01 | 2.53 | 2.52 | 0.06 | 2.51 | 2.45 | 289 | 17 | 0 | SEED | | | | | | | 0 | 264497 | 2 | BK | JE |
| 17-Aug-16 | HS2 | 0.29 | 2.54 | 2.25 | 0.36 | 2.50 | 2.14 | 0 | 24 | 194 | SEED | | | | | | | 0 | 264497 | 0 | AB | CA |
| 17-Aug-16 | HS1 | 2.06 | 3.50 | 1.44 | 2.16 | 3.48 | 1.32 | 276 | 5 | 0 | SEED | | | | | | | 0 | 264497 | 1 | FD | HK |
| 17-Aug-16 | HS4 | 2.12 | 4.24 | 2.12 | 2.17 | 4.20 | 2.03 | 0 | 9 | 136 | SEED | | | | | | | 0 | 264497 | 0 | JN | RO |
| 17-Aug-16 | HS3 | 2.54 | 4.22 | 1.28 | 3.02 | 4.16 | 1.14 | 65 | 0 | 0 | SEED | | | | | | | 0 | 264497 | 0 | KM | JZ |
| 17-Aug-16 | HS5 | 3.21 | 4.02 | 0.41 | 3.28 | 3.58 | 0.30 | 0 | 2 | 0 | SEED | | | | | | | 0 | 264497 | 0 | BK | JE |
| 17-Aug-16 | HS2 | 3.44 | 4.21 | 0.37 | 3.48 | 4.17 | 0.29 | 0 | 0 | 0 | REPO | 12.27 | 610 | 57 | 330 | 21416 | | 0 | 285916 | 0 | AB | CA |
| 22-Aug-16 | HS5 | 16.26 | 16.53 | 0.27 | 16.34 | 16.51 | 0.17 | 0 | 0 | 0 | PR | | | | | | | 0 | 285916 | 0 | BK | FD |
| 22-Aug-16 | HS5 | 23.43 | 0.09 | 0.26 | 23.50 | 0.07 | 0.17 | 0 | 0 | 0 | PR | 0.00 | 0 | 0 | 0 | 0 | | 0 | 285916 | 0 | BK | FD |
| 26-Aug-16 | HS2 | 17.17 | 17.50 | 0.33 | 17.30 | 17.48 | 0.18 | 0 | 0 | 0 | PR | | | | | | | 0 | 285916 | 0 | BK | CA |
| 26-Aug-16 | HS2 | 22.59 | 23.24 | 0.25 | 23.04 | 23.21 | 0.17 | 0 | 0 | 0 | PR | 0.00 | 0 | 0 | 0 | 0 | | 0 | 285916 | 0 | BK | CA |
| 01-Sep-16 | HS1 | 1.00 | 3.20 | 2.20 | 1.06 | 3.17 | 2.09 | 22 | 13 | 0 | SEED | | | | | | | 0 | 285916 | 1 | FD | JE |
| 01-Sep-16 | HS2 | 0.57 | 3.29 | 2.32 | 1.10 | 3.24 | 2.14 | 0 | 12 | 154 | SEED | | | | | | | 0 | 285916 | 0 | AB | CA |
| 01-Sep-16 | HS4 | 1.22 | 3.20 | 1.58 | 1.30 | 3.15 | 1.45 | 0 | 5 | 116 | SEED | 6.50 | 22 | 30 | 270 | 5486 | | 0 | 291403 | 0 | JN | RO |
| 01-Sep-16 | HS4 | 16.20 | 16.56 | 0.36 | 16.35 | 16.53 | 0.18 | 0 | 0 | 0 | PR | | | | | | | 0 | 291403 | 0 | JN | RO |
| 02-Sep-16 | HS4 | 0.14 | 0.40 | 0.26 | 0.21 | 0.35 | 0.14 | 0 | 0 | 0 | PR | 0.00 | 0 | 0 | 0 | 0 | | 0 | 291403 | 0 | JN | RO |
| 05-Sep-16 | HS3 | 23.36 | 2.30 | 2.54 | 23.44 | 2.24 | 2.40 | 72 | 14 | 0 | SEED | 2.54 | 72 | 14 | 0 | 3540 | | 0 | 294943 | 2 | KM | JZ |
| 12-Sep-16 | HS1 | 17.20 | 17.43 | 0.23 | 17.34 | 17.41 | 0.07 | 0 | 0 | 0 | MX | 0.00 | 0 | 0 | 0 | 0 | | 0 | 294943 | 0 | FD | JE |

ALBERTA HAIL SUPPRESSION PROJECT
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APPENDIX E – FORMS

Weather Forecast Worksheet



| | |
|---|------------------|
| <p>Today's CDC</p> <p style="font-size: 2em; font-weight: bold;">X</p> | <p>Synopsis:</p> |
|---|------------------|

Forecast:

Day 2 Outlook CDC: X

| | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|----------------------------------|--------------------------------------|--|--|---|-------------------------------------|---|--|--------------------------------------|----------------------------------|---|--------------------------------------|--|---|--|---|---|---------------------------------------|---|---------------------------------------|---|---------------------------------------|-------------------------------------|--|
| <p>Model Sounding XXX XXZ</p> <p>Freezing Level: kft -5°C Level: kft -10°C Level: kft Equilibrium Level: kft Tropopause: kft Cloud Base Height: kft Cloud Base Temp: °C Cell Motion: @ kts Storm Motion: @ kts Temp Max: °C Dew Point: °C Convective Temp: °C CAPE: J/Kg CIN: J/Kg Lifted Index: Showalter Index: Total Totals: Precipitable Water: inches WINDEX: mph</p> | <p>Hailcast Model Output</p> <p>CALGARY:</p> <p>RED DEER:</p> <table style="width: 100%;"> <tr> <td><input type="checkbox"/> Jet PVA</td> <td><input type="checkbox"/> Morning Fog</td> </tr> <tr> <td><input type="checkbox"/> Short Wave Trof</td> <td><input type="checkbox"/> Gusty SFC Winds</td> </tr> <tr> <td><input type="checkbox"/> Lee Cyclogenesis</td> <td><input type="checkbox"/> Loaded Gun</td> </tr> <tr> <td><input type="checkbox"/> Directional Wind Shear</td> <td><input type="checkbox"/> Theta E Ridge</td> </tr> <tr> <td><input type="checkbox"/> Speed Shear</td> <td><input type="checkbox"/> Chinook</td> </tr> <tr> <td><input type="checkbox"/> PM Radiative Cooling</td> <td><input type="checkbox"/> Cloud Cover</td> </tr> <tr> <td><input type="checkbox"/> AM ACC or Cloud Streets</td> <td><input type="checkbox"/> Insolation (sfc heating)</td> </tr> <tr> <td><input type="checkbox"/> NE Moisture Advection</td> <td><input type="checkbox"/> Latent Instability</td> </tr> <tr> <td><input type="checkbox"/> Cooling at 500mb</td> <td><input type="checkbox"/> Frontal Lift</td> </tr> <tr> <td><input type="checkbox"/> Warming at 500mb</td> <td><input type="checkbox"/> Upslope Flow</td> </tr> <tr> <td><input type="checkbox"/> Dry Line or Dry Slot</td> <td><input type="checkbox"/> Low Ceilings</td> </tr> <tr> <td><input type="checkbox"/> Smoke/Haze</td> <td><input type="checkbox"/> Flood Potential</td> </tr> </table> | <input type="checkbox"/> Jet PVA | <input type="checkbox"/> Morning Fog | <input type="checkbox"/> Short Wave Trof | <input type="checkbox"/> Gusty SFC Winds | <input type="checkbox"/> Lee Cyclogenesis | <input type="checkbox"/> Loaded Gun | <input type="checkbox"/> Directional Wind Shear | <input type="checkbox"/> Theta E Ridge | <input type="checkbox"/> Speed Shear | <input type="checkbox"/> Chinook | <input type="checkbox"/> PM Radiative Cooling | <input type="checkbox"/> Cloud Cover | <input type="checkbox"/> AM ACC or Cloud Streets | <input type="checkbox"/> Insolation (sfc heating) | <input type="checkbox"/> NE Moisture Advection | <input type="checkbox"/> Latent Instability | <input type="checkbox"/> Cooling at 500mb | <input type="checkbox"/> Frontal Lift | <input type="checkbox"/> Warming at 500mb | <input type="checkbox"/> Upslope Flow | <input type="checkbox"/> Dry Line or Dry Slot | <input type="checkbox"/> Low Ceilings | <input type="checkbox"/> Smoke/Haze | <input type="checkbox"/> Flood Potential |
| <input type="checkbox"/> Jet PVA | <input type="checkbox"/> Morning Fog | | | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> Short Wave Trof | <input type="checkbox"/> Gusty SFC Winds | | | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> Lee Cyclogenesis | <input type="checkbox"/> Loaded Gun | | | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> Directional Wind Shear | <input type="checkbox"/> Theta E Ridge | | | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> Speed Shear | <input type="checkbox"/> Chinook | | | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> PM Radiative Cooling | <input type="checkbox"/> Cloud Cover | | | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> AM ACC or Cloud Streets | <input type="checkbox"/> Insolation (sfc heating) | | | | | | | | | | | | | | | | | | | | | | | | |
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| <input type="checkbox"/> Cooling at 500mb | <input type="checkbox"/> Frontal Lift | | | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> Warming at 500mb | <input type="checkbox"/> Upslope Flow | | | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> Dry Line or Dry Slot | <input type="checkbox"/> Low Ceilings | | | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> Smoke/Haze | <input type="checkbox"/> Flood Potential | | | | | | | | | | | | | | | | | | | | | | | | |

Verification

Observed CDC: **X**
 Max TITAN cell top: km
 Max VIL: kg/m²
 Max reflectivity: dBz
 YYC:
 YQF:
 Radar:
 Hail Reports:

| Convective Day Category (CDC) | | |
|-------------------------------|----------------|---|
| -3 | No Seeding | Clear skies, fair weather cumulus, or stratus without rain, no deep convection |
| -2 | No Seeding | Towering Cumulus, altocumulus, alto-stratus, or nimbostratus producing rain for several hours or weak echoes (e.g. virga) |
| -1 | No Seeding | Scattered convective rain showers but no threat of hail. No reports of lightning. |
| 0 | Patrol/Seeding | Thunderstorms (at least one) but no hail. VIL < 20 kg/m ² within the project area or buffer zones |
| +1 | Seeding | Thunderstorms with pea or shot size hail (0.5 to 1.2 cm diameter). 20 kg/m ² < VIL < 30 kg/m ² |
| +2 | Seeding | Thunderstorms with grape size hail (1.3 to 2.0 cm diameter). 30 kg/m ² < VIL < 70 kg/m ² |
| +3 | Seeding | Thunderstorms with walnut size hail (2.1 to 3.2 cm diameter). 70 kg/m ² < VIL < 100 kg/m ² |
| +4 | Seeding | Thunderstorms with golf ball size hail (3.3 to 5.2 cm diameter). VIL > 100 kg/m ² |
| +5 | Seeding | Thunderstorms with greater than golf ball size hail (>5.2 cm diameter). |

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**ALBERTA HAIL SUPPRESSION PROJECT
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| 250mb Jet Level Winds | 500mb Heights & Vorticity |
|-----------------------------------|-----------------------------------|
| <p>CLICK HERE TO UPLOAD IMAGE</p> | <p>CLICK HERE TO UPLOAD IMAGE</p> |
| 850mb Theta E / Winds | Surface Analysis |
| <p>CLICK HERE TO UPLOAD IMAGE</p> | <p>CLICK HERE TO UPLOAD IMAGE</p> |

Form Complete:

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FINAL OPERATIONS REPORT 2016

DAILY FORECAST
Weekday XX MONTH
Alberta Hail Suppression Project 2016

WEATHER MODIFICATION
INCORPORATED
Forecaster: SELECT NAME

WRF Model Sounding

CLICK HERE TO UPLOAD IMAGE

REV 1, 05-2016

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WMI Radar Observer Log

| WMI Radar Log 2016 AHSP Olds-Didsbury Radar Operations Centre | | Date (UTC): _____ | | |
|---|---|---------------------------|---------------|--------------------|
| | | Operator(s): _____ | | Page: ____ of ____ |
| TIME hh:mm (UTC) | Radar Summary <small>PPHNE, #WATS, DTAR, etc etc</small> | Remarks, Action, Decision | Carvel Radar* | Strathmore Radar* |
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REV 1, 05-2016

*Indicate Environment Canada radar summary when Olds-Didsbury radar summary is blank.

ALBERTA HAIL SUPPRESSION PROJECT
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WMI Seeding Aircraft Flight Log

| WMI CLOUD SEEDING FLIGHT LOG | | | | | | | | | | | |
|------------------------------|--------------|-------------------------|--------------------------|--------------|--------------|--------------------------|------------|-----------|--------------------------|-----------------|--------------------------|
| PROJECT | | PROJECT NAME | | | Mission Type | | TYPE | Hobbs Off | Engines Off | Landing | FLY DEPARTURE DATE |
| REV 1, 09-2015 | | Departure Airport | | | N-Number | | Aircraft # | Hobbs On | Engines On | Takeoff | |
| Pilot | | Copilot | | | N-Number | | Aircraft # | HS # | Hailstop # | Flight Time | Page # 1 |
| Time (UTC) | Event No. | Latitude (deg & min) | Longitude (deg & min) | Alt (Kft) | Flares | | Generators | | Remarks and Observations | | |
| | | | | | Ejectable | BIP 150g | On | Off | | | |
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| | | | | | | | | | | | |
| RH GEN | | | | | | Page Total: | 0 | 0 | | Flight Summary: | |
| LH GEN | | | | | | Total Seeding Attempted: | | | | | |
| TOTAL | | | | | | Less Misfires: | | | | | |
| | | | | | | Total Flares Used: | 0 | 0 | | | |
| Mission Type | Seeding | SEED | Reposition | REPO | Maintenance | MX | | | | | |
| Categories: | Recon | RECON | Publicity | PR | Ferry | FER | | | | | |
| | Patrol | PAT | Currency | CUR | | | | | | | |

**ALBERTA HAIL SUPPRESSION PROJECT
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APPENDIX F – AIRCRAFT SPECIFICATIONS

Several types of aircraft are presently utilized on the project. Though all are twin-engine, the engine type and other performance characteristics make each significantly different from the others. Of the four HAILSTOP aircraft presently used on the project, two are turboprop (prop-jet) aircraft, and the other two are powered by turbocharged, reciprocating piston engines. While the turboprop aircraft are faster and more powerful, they are also more expensive to operate, so the two piston-engine aircraft are used to operate where less performance is needed—at cloud base.

CESSNA 340A AIRCRAFT

Primary mission: cloud base seeding
Power Type, Turbocharged piston twin engine
6290 lbs gross weight
4184 lbs empty weight
1802 lbs useful load
310 hp per engine
280 mph max speed
263 mph rec. cruise
82 mph stall dirty
183 - 203 gals fuel capacity
29,800 feet all engine service ceiling
15,800 feet single engine service ceiling
1650 feet per minute all engine rate of climb
315 feet per minute single engine rate of climb
2175 feet for takeoff over 50 foot obstruction
1615 feet for takeoff ground roll
1850 feet land over 50 foot obstruction
770 foot land ground roll
34 ft 4 in length
12 ft 7 in height
38 ft 1 in wingspan

BEECHCRAFT KING AIR C90

Primary mission: cloud-top seeding
Power Type, Turboprop twin engine
PT6A-21 engines
Full deicing capabilities
9650 lbs gross weight
6382 lbs empty weight
3268 lbs useful load
550 hp per engine
208 kts max speed
185 kts recommended cruise
74 kts dirty stall
384 gals fuel capacity
30,000 feet all engine service ceiling
14,200 single engine service ceiling
1500 feet per minute all engine rate of climb
350 feet per minute single engine rate of climb
3100 for takeoff over a 50 foot obstruction
2250 feet take off roll
1730 feet for landing over 50 foot obstacle
800 foot landing roll
35 ft 6 in length
14 ft 3 in height
50 ft 3 in wingspan

**ALBERTA HAIL SUPPRESSION PROJECT
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APPENDIX G – GROUND SCHOOL AGENDA



Alberta Hail Suppression Project (AHSP)

2016 Ground School – Monday, May 30th Calgary, Alberta

Intact Zone Training Centre – Red Room
12th Floor- Energy Plaza East Tower
311-6th Avenue SW, Calgary AB

- 08:45 Welcome and Staff Introductions
 - Jim Sweeney, WMI Executive Vice President
 - Dr. Terry Krauss, Alberta Severe Weather Management Society (ASWMS) Project Director
 - Bruce Boe, WMI Vice President - Meteorology
- 09:00 Introduction from the Insurance Industry
 - Todd Klapak, Alberta Severe Weather Management Society Board Chair
- 09:15 History and Status of the Alberta Hail Suppression Program
 - Terry Krauss
- 10:00 Break
- 10:15 Overview of 1996-2015 Alberta Operations
 - Brad Waller, WMI Project Meteorologist
- 10:45 Hail Program Overview and Status of Hail Suppression Concepts
 - Bruce Boe
- 11:30 Severe Weather Forecasting & Daily Forecast Sheet
 - Brad Waller, WMI Chief Meteorologist
- 12:00 Lunch (On-Site – AHSP Provided)
- 12:45 ATC Controlling Procedures
 - Calgary Terminal &/or Edmonton Control (TBD)
 - YBW Springbank Tower (TBD)

Attendance is mandatory for all Weather Modification, Inc. project personnel.

ALBERTA HAIL SUPPRESSION PROJECT
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- 13:30 Aviation Weather & Special Procedures
 Cloud Seeding Aircraft & Equipment
 Targeting - Seeding Rates
 Storm Tracking and Directing
 Jody Fischer, WMI Chief Pilot & Canada Project Manager

- 14:45 Job Responsibilities/ Duties
 Bruce Boe
 Terry Krauss

- 15:00 Break

- 15:15 Project Operations: Routines, Procedures, and Meteorological
 Information
 Dan Gilbert

- 16:00 Safety and Emergency Procedures
 Jody Fischer

- 16:15 End of Ground School

ALBERTA HAIL SUPPRESSION PROJECT
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Alberta Hail Suppression Project (AHSP)

2016 Ground School – Tuesday, May 31st, Calgary, Alberta

Holiday Inn Express Banff Trail
2373 Banff Trail North West, Calgary AB

- 09:30 Field Personnel Pictures
- 09:50 Presentation of 2015 Photography Contest Awards
- 10:00 WMI Representation and Professionalism
WMI Job Responsibilities/ Duties
Jody Fischer, WMI Chief Pilot & Canada Project Manager
Bruce Boe, WMI Vice President - Meteorology
- 10:30 Approved Flight Operations
Aircraft Maintenance Procedures & Pilot Discussion
Aircraft Binders, NAFTA
Aircraft Refueling Procedures
Jody Fischer
- 11:00 Sharefile Introduction
Paperwork Procedures
Erin Fischer, WMI Project Assistant
- 11:45 Accounting – Company Expense Reports
- 12:00 Team Lunch (WMI Provided)
- 13:00 Sharefile iPad Session with Field Crew
Erin Fischer
- 14:30 Cloud Seeding Chemical Inventory & Procedures
Jody Fischer
- 14:45 Additional Project Discussion – Q & A
- 15:30 End of Ground School

Attendance is mandatory for all Weather Modification, Inc. project personnel.

**ALBERTA HAIL SUPPRESSION PROJECT
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APPENDIX H – AIRBORNE SEEDING SOLUTION

- Chemical Formulation: 2% AgI - 0.5 NH₄I - 0.1 C₆H₄Cl₂ - 1.0 NaClO₄
- Recommended Burn Rate: ~2.0 gph
- Nucleation Mechanism: Condensation Freezing
- Total Solution Weight: 33.5 lbs.
- Volume: ~ 5.0 gallons, (20 liters) scale for other amounts
- Seeding Aerosol: AgI_{0.85} AgCl_{0.15} NaCl

| CONSTITUENT | CHEMICAL FORMULATION | MOLECULAR WT.(G/MOLE) | MASS (G) | WEIGHT (LB.) | VOLUME (GAL) |
|-------------------------|---|-----------------------|---------------|--------------|--------------|
| Silver Iodide | AgI | 234.77 | 304.2 | 0.67 | n/a |
| Ammonium Iodide | NH ₄ I | 144.94 | 93.9 | 0.21 | n/a |
| Paradichloro-benzene | C ₆ H ₄ Cl ₂ | 147.00 | 19.0 | 0.042 | n/a |
| Sodium Perchlorate, 99% | NaClO ₄ | 140.48 | 181.8 | 0.40 | n/a |
| Water | H ₂ O | 17.99 | 607.7 or less | 1.34 | 0.202 |
| Acetone | (CH ₃) ₂ CO | 58.08 | 13985.5 | 30.84 | 4.645 |

Note: Sodium Perchlorate, anhydrous can be utilized in the formula by adjusting the weight or mass to include 0.34 lb or 158.1 g respectively, although proper handling becomes more difficult. Water amounts should be increased to 1.40 lb or 630 g (0.21 gal).

Note: Use 2.4 urinal pucks (85 gram Paradichloro-benzene) for 205 litre barrel of acetone.

Mixing procedures are as follows:

- 1.) Combine AgI and acetone in a 5 gallon container and begin stirring;
- 2.) Combine ammonium iodide, sodium perchlorate and water in another small container and stir until the solution is clear and cool (caution the perchlorate is a strong oxidizer and needs to be done at room temperatures, don't do this in a hot hanger)
- 3.) Add the ammonium iodide, sodium perchlorate and water mixture to the stirring silver iodide/acetone slurry;
- 4.) Continue mixing until the solution is clear;
- 5.) Add the paradichlorobenzene any time after you have added container #2 and the solution is beginning to clear;
- 6.) Continue mixing for another 10 minutes until very clear; and
- 7.) Pump the solution into the aircraft generator immediately after mixing or store in an appropriate labeled sealed container. Storage containers can be either stainless or plastic (polypropylene).

Supplier: Solution Blend Service
2720 7th Avenue N.E., Calgary, AB, T2A 5G6
403-207-9840