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At 5:37 pm, storm #1 had finally moved east of Red Deer. Hailstop 3 had depleted their ejectable flares, so it returned to base, landing in Red Deer at 5:43 pm. Hailstop 4 was repositioned from the Red Deer storm to the Innisfail storm at 5:37 pm. At 5:53 pm, Hailstop 1 had exhausted their ejectable flares and returned to base in Springbank, landing at 6:11pm. At 5:54 pm, Hailstop 2 was low on seeding agent, so they also returned to base in Springbank once HS4 took over seeding the storm, landing at 6:14 pm. Hailstop 4 continued seeding storm #4 until the storm had passed through Innisfail. They stopped seeding at 6:08 pm, but flew to Springbank instead of Red Deer because of approaching (non-severe) weather, landing at 6:31 pm. Once HS4 landed, all aircraft were on the ground re-arming and fueling.

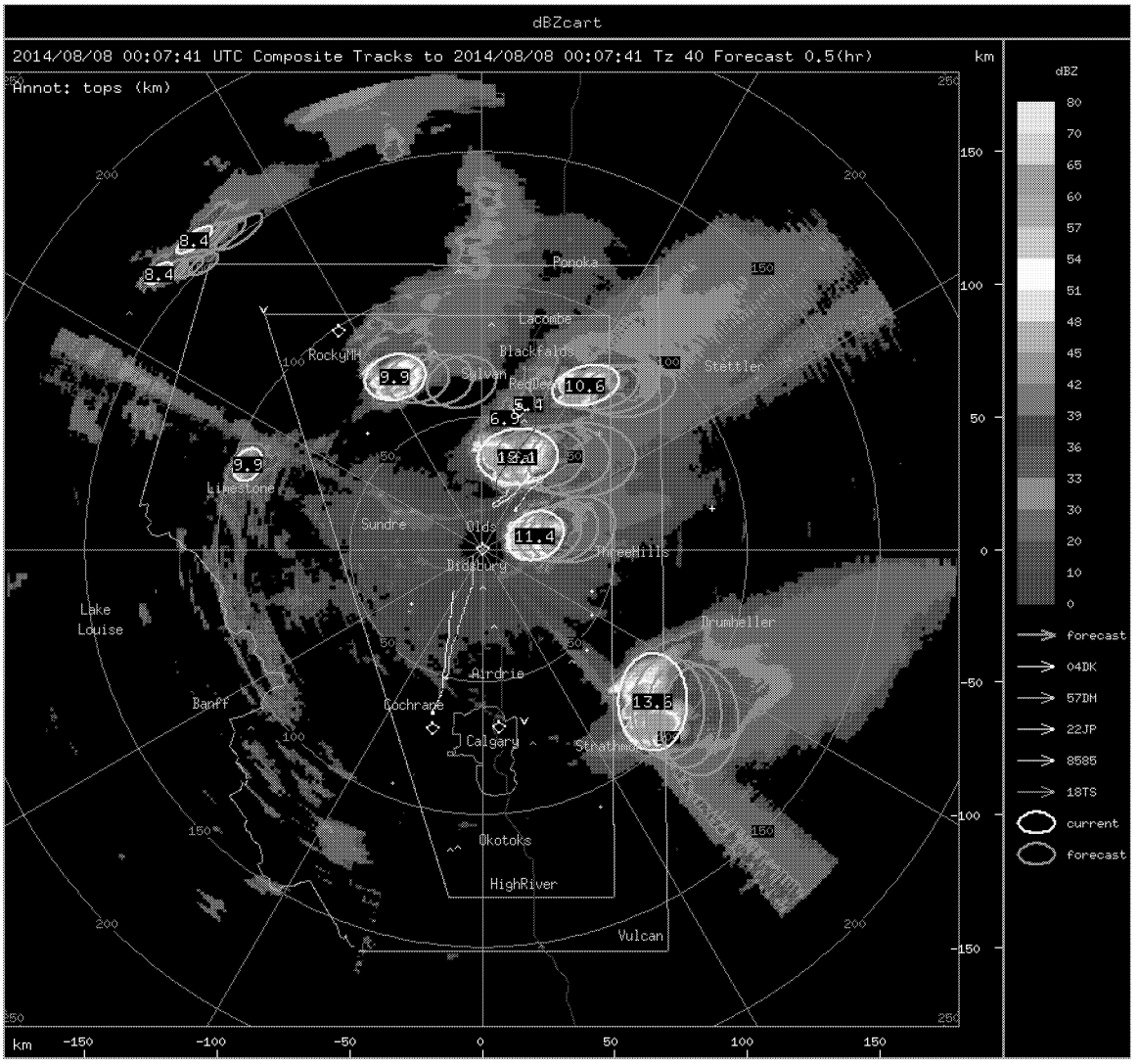


Fig. 45. By 00:07 UTC (6:07 pm MDT) the first five cells were mostly downwind of cities within the protected area. The exception was the weakest of the cells, which was still west of Sylvan Lake, and a stronger cell between Olds and Red Deer which was still being seeded by Hailstop 3 (top) and Hailstop 4 (base). The tracks of Hailstop 1 and Hailstop 2 are shown, as they flew back to Springbank.

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At 6:18 pm MDT another wave of intense convection developed, and Hailstop 3 was dispatched to the Penhold area. Hailstop 3 was airborne at 6:36 pm and began seeding storm #5 for Penhold at 6:41 pm. They gradually worked their way westward along a line of storms from Penhold toward Sundre and began seeding storm #6 for Sundre at 7:07 pm. At 6:38 pm, Hailstop 5 was launched to new development north of Cochrane, which was tracking toward Airdrie. They were airborne at 7:00 pm and began top seeding storm #7 for Airdrie at 7:10 pm. Hailstop 2 was also launched toward storm #7 at 7:04 pm and was airborne at 7:14 pm, but was forced to land back in Springbank without seeding due to a problem with the aircraft's transponder. Hailstop 4 was available right there in Springbank to replace them however, and was scrambled from Springbank at 7:24 pm to seed the Airdrie storm. Hailstop 4 was airborne at 7:42 pm and began base seeding storm #7 at 7:53 pm, while Hailstop 5 continued top seeding above. Hailstop 4 reported some intermittent difficulty getting to the best inflow areas due to restrictions periodically imposed by Air Traffic Control.

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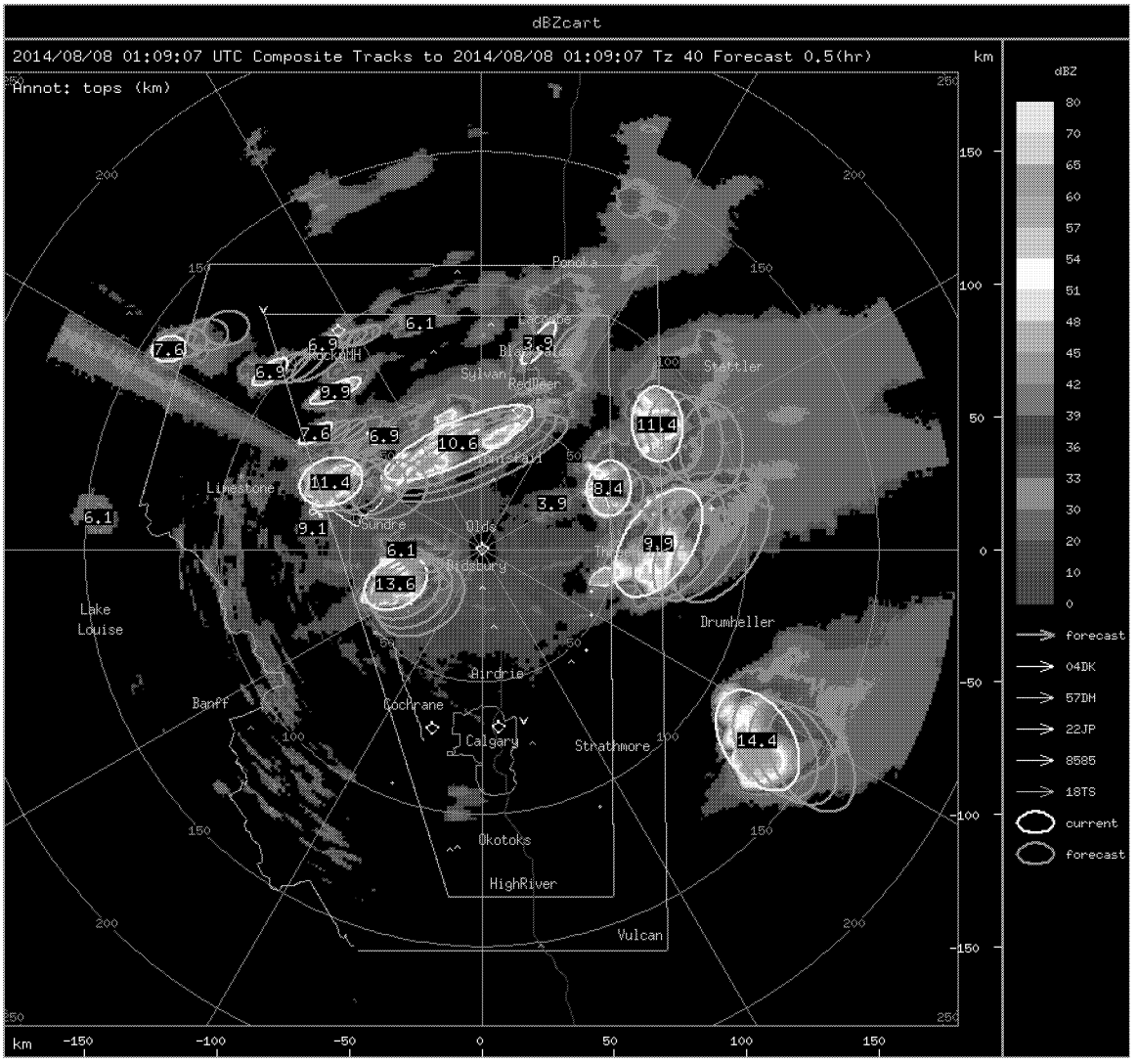


Fig. 46. Shortly after the first supercells began to exit the protected area a new series of intense storms developed. Shown here at 1:09 UTC (7:09 pm MDT), these storms developed rapidly, quickly attaining severe status. At this time, Hailstop 3, still airborne from the previous storms, began seeding a line of cells that extended from near Red Deer to Sundre. Another intense storm was taking aim at Airdrie and Hailstop 5 was dispatched.

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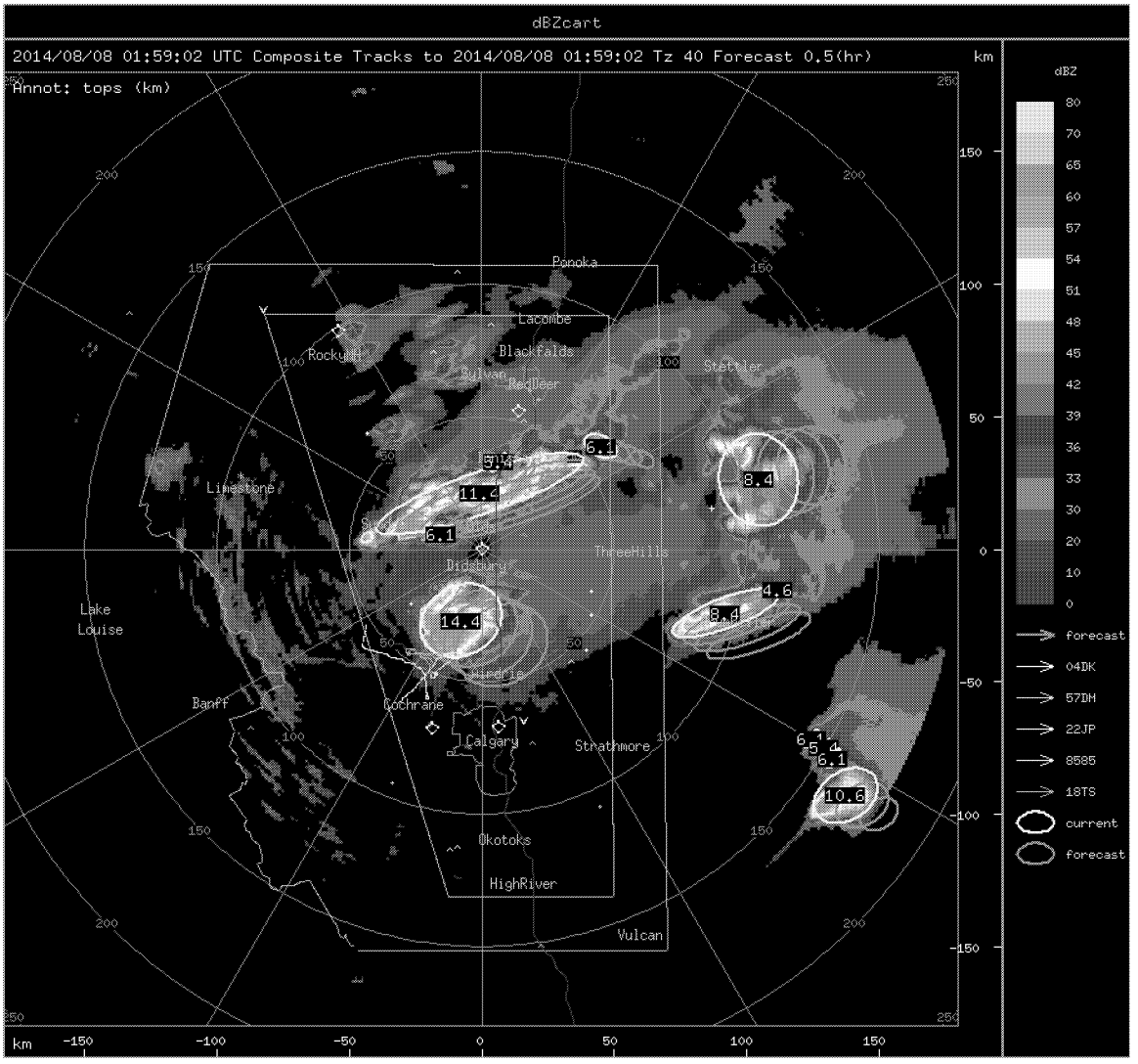


Fig. 47. At 1:59 UTC (7:59 pm MDT), as the Sundre-to-Red Deer storms weakened, Hailstop 3 flew to Springbank, circumnavigating the cell being seeded by Hailstop 4 and Hailstop 5, which was still moving toward Airdrie.

At 7:38pm, the line of convection stretching from Sundre to Innisfail was no longer a hail threat for protected cities, so Hailstop 3 stopped seeding near Sundre, and diverted to nearby Springbank, landing at 8:00 pm. Hailstop 4 and Hailstop 5 continued seeding storm #7, which had severe radar signatures, as it approached Airdrie. Storm #7 struck Airdrie at about 7:30 pm, the second hailstorm to pass through Airdrie on the day. The earlier storm was more severe as judged by radar parameters, but additional hail resulted from the second storm in spite of its being seeding at base and cloud top.

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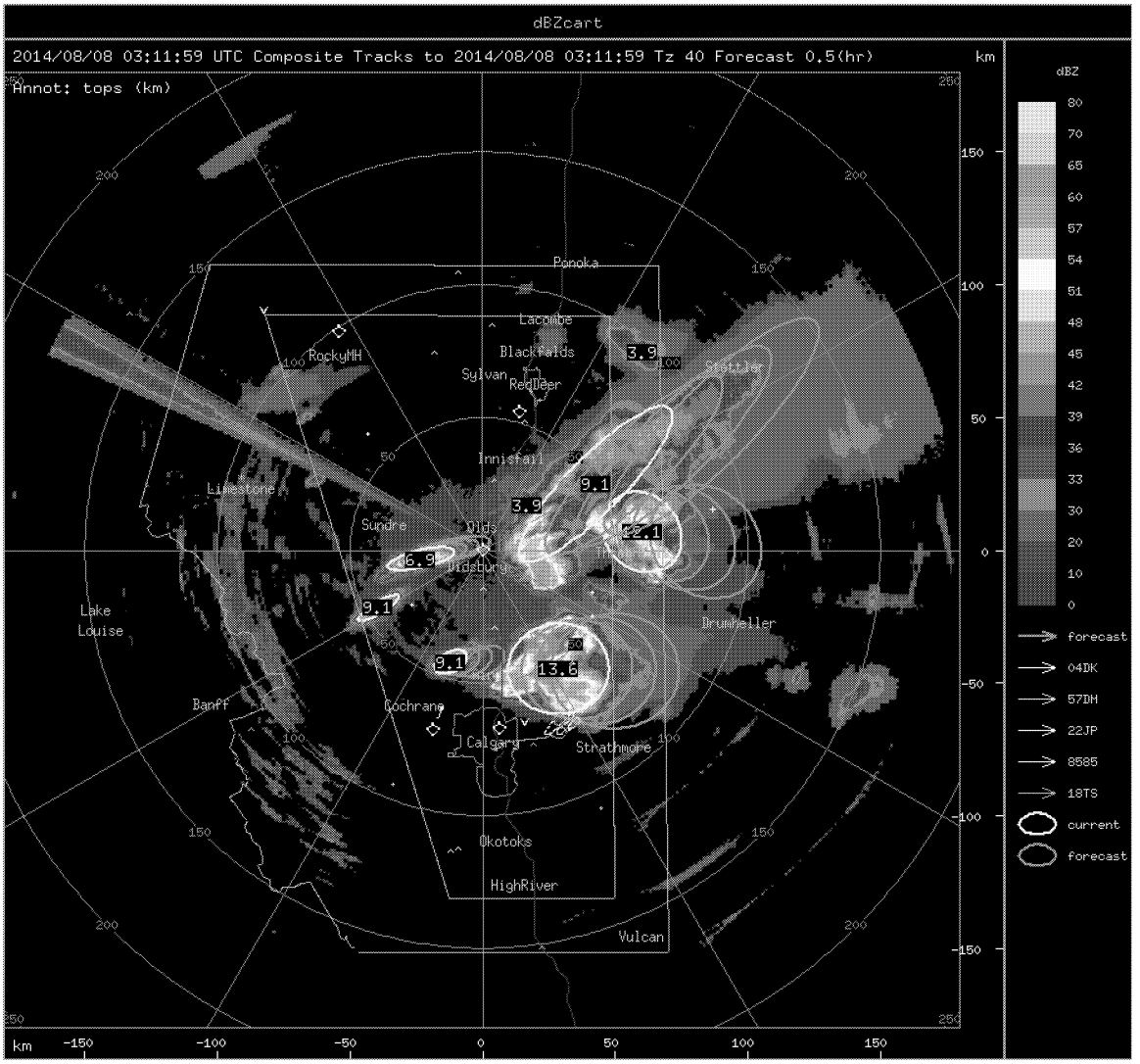


Fig. 48. The second wave of storms had moved mostly east of cities in the protected area by 3:12 UTC (9:12 pm MDT). However, because a possibility remained that Strathmore might be hit, Hailstop 4 remained on station, seeding until 9:13, until it was certain that Strathmore would be in the clear.

Storm #7 passed directly over Airdrie. Once the storm had moved east of the QE2 highway, Hailstop 5 was low on seeding agent, so they stopped seeding at 9:08 pm and returned to Springbank. TITAN cell tracking indicated the storm would likely miss Strathmore. Nevertheless, Hailstop 4 remained on station, base seeding the storm as a precautionary measure, but the cell ultimately tracked just north of Strathmore. Hailstop 4 stopped seeding at 9:13 and returned to base, landing at 9:46 pm, back in Red Deer. Hailstop 3 was repositioned to Red Deer after getting fuel and flares in Springbank.

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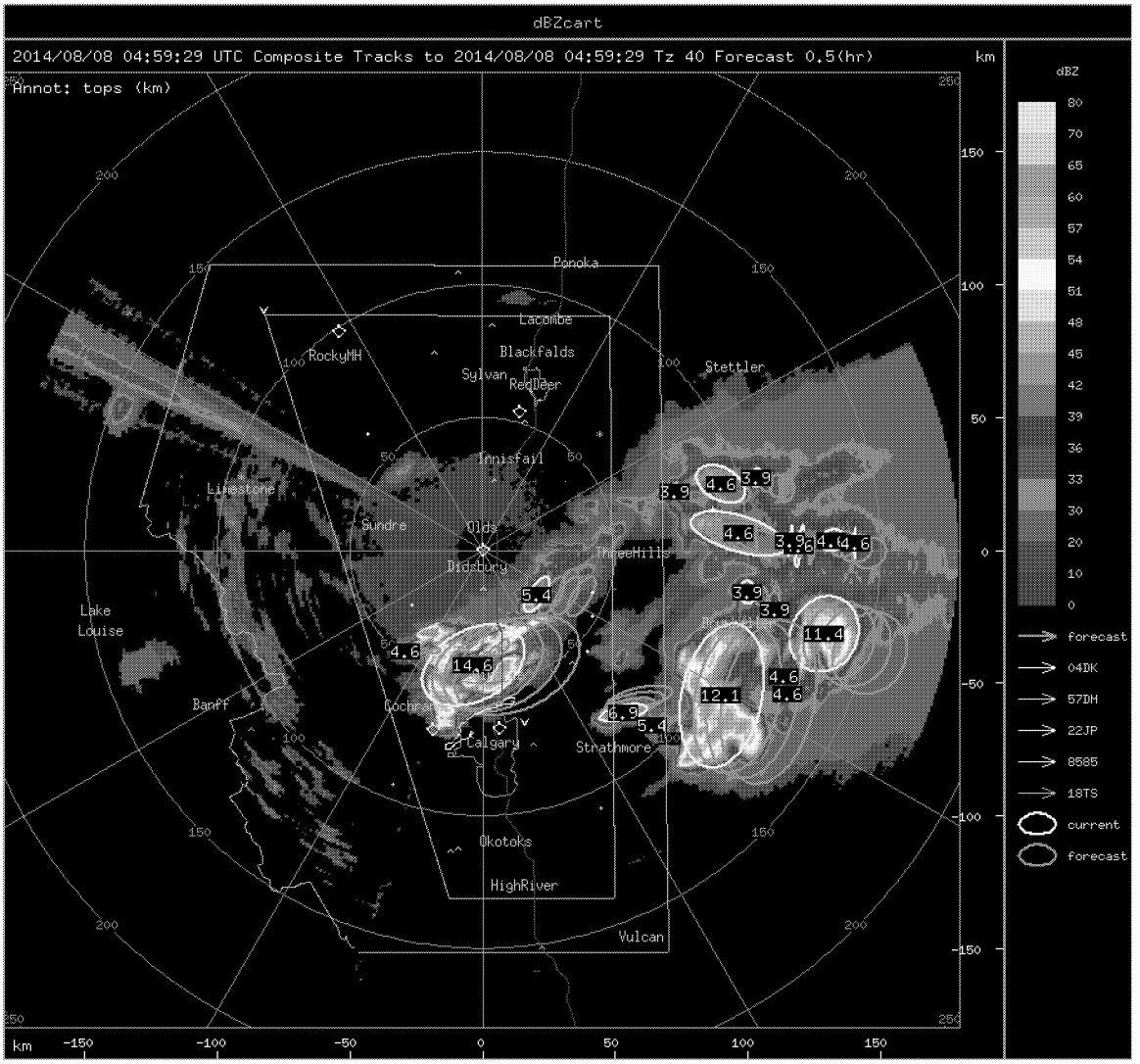


Fig. 49. August 7, 2014, the day when storms would not end, continued. Shown here, at 4:59 UTC (10:59 pm MDT), a cluster of thunderstorms developed over northern Calgary and Airdrie. Though less-energetic than their earlier-day predecessors, Hailstop 1 was launched at 9:48 pm MDT and top-seeded over Calgary from 10:29 to 11:33, until the storm was below hail criteria.

Yet another storm developed over Airdrie and Northern Calgary at 9:48. (the third of the day for Airdrie). This storm occurred late in the evening when there was less instability. Therefore, this convection had less severe radar parameters and was disorganized. Nonetheless, the storm cluster (#8) posed a marginal hail threat for northern Calgary, so Hailstop 1 was launched at 9:48 pm. They were airborne at 10:04 pm, and began top seeding over Calgary at 10:29 pm. The storm was gradually losing strength after the sun went down and the atmosphere slowly stabilized. At 11:33 pm, the storm finally weakened below hail criteria, and Hailstop 1 returned to base, landing at 11:47 pm. This was the final flight of the day.

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## CONCLUSIONS

August 7th proved to be the most severe hail day of the 2014 season. Not surprisingly, it was also the most heavily seeded day of the summer with 46,698 total grams of seeding material dispensed. This is a very high amount of seeding material for a single day, and eclipses most storm days in recent history. For comparison, the most seeded storm days for 2012 and 2013 were 26,455 grams and 27,996 grams respectively. A total of 1,191 ejectable flares were utilized along with 143 burn-in-place flares and 704 minutes of wingtip generator time. This upswing in seeded grams is partially due to the addition of the 5th seeding aircraft. Three separate hailstorms impacted Airdrie on the day (all were seeded) dealing blow after blow of large, wind-driven hail. This was after major storms had already pummeled the same city on July 17th and on August 6th. There were eight seeded storms this day with ten seeding flights for 22 hours 47 minutes of flight time (not including reposition or maintenance flights).

There were numerous reports of large damaging hail, severe wind gusts and urban flooding around the region. Golf ball size hail was reported in Airdrie and Eckville. Two inch hail was measured in western Red Deer while pea size hail was reported over northeastern Red Deer. Toonie-size hail occurred 10 miles west of the Olds-Didsbury airport. Pea size hail fell at the Olds-Didsbury airport radar site twice during the day. Grape size hail fell west of the town of Olds. A gustnado was also observed near Airdrie (non-severe). Significant hail damage occurred in Airdrie after three separate cells passed through town. The large hail was accompanied by severe winds in excess of 60 km/h. The wind-driven nature of the hail meant that severe damage was not confined to just horizontal surfaces like cars and roofs. Vertical surfaces such as siding and windows were also damaged on a wide scale.

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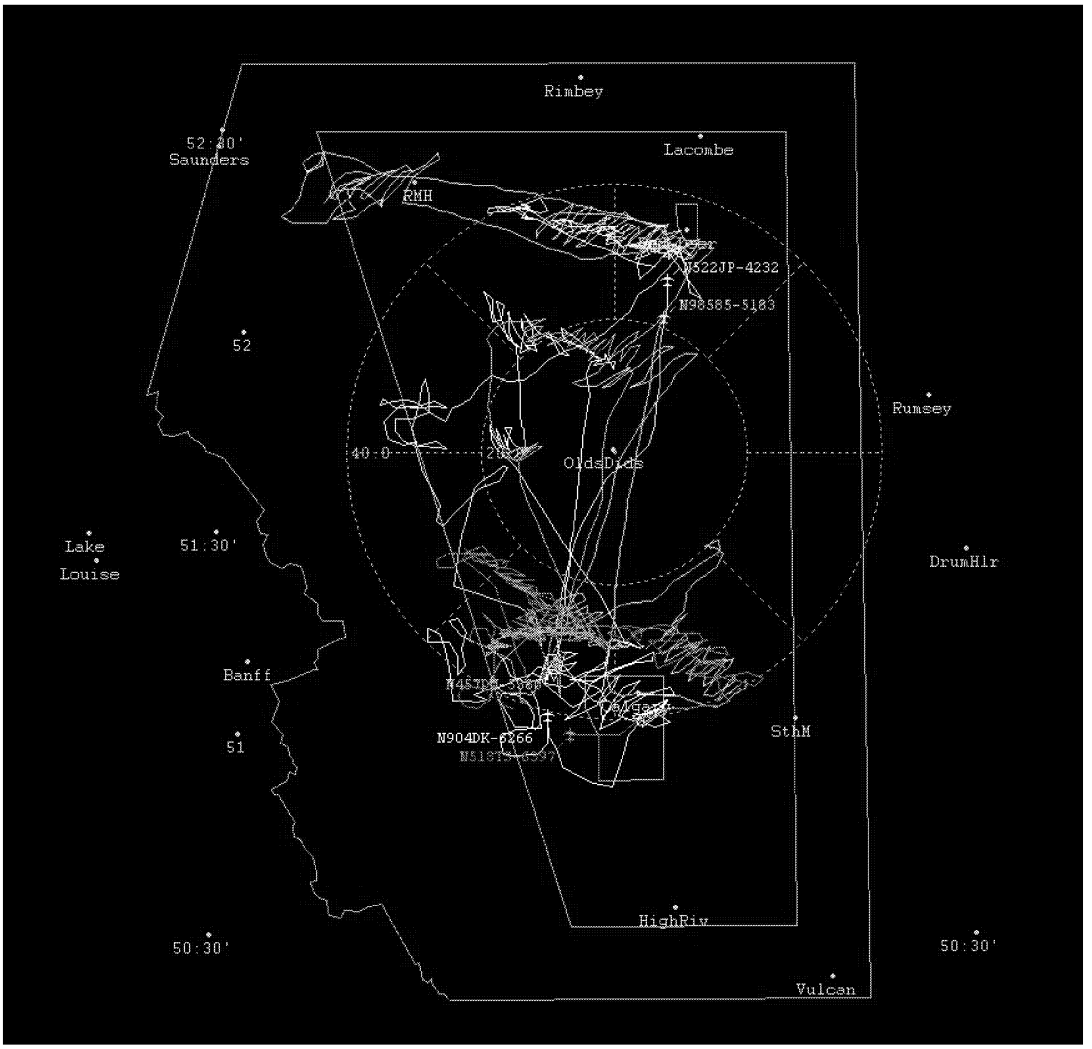


Fig. 50. AirLink GPS aircraft seeding tracks for the entire storm day of August 7, 2014. Track colors are as follows: Hailstop 1, white; Hailstop 2, orange; Hailstop 3, light blue; Hailstop 4, green; and Hailstop 5, pink. The WMI AirLink aircraft tracks show that the storms that moved through Airdrie, Calgary and Red Deer were well-seeded, with constant passes upwind of the protected cities. The onset of seeding occurred at the appropriate time for effects in the protected cities.

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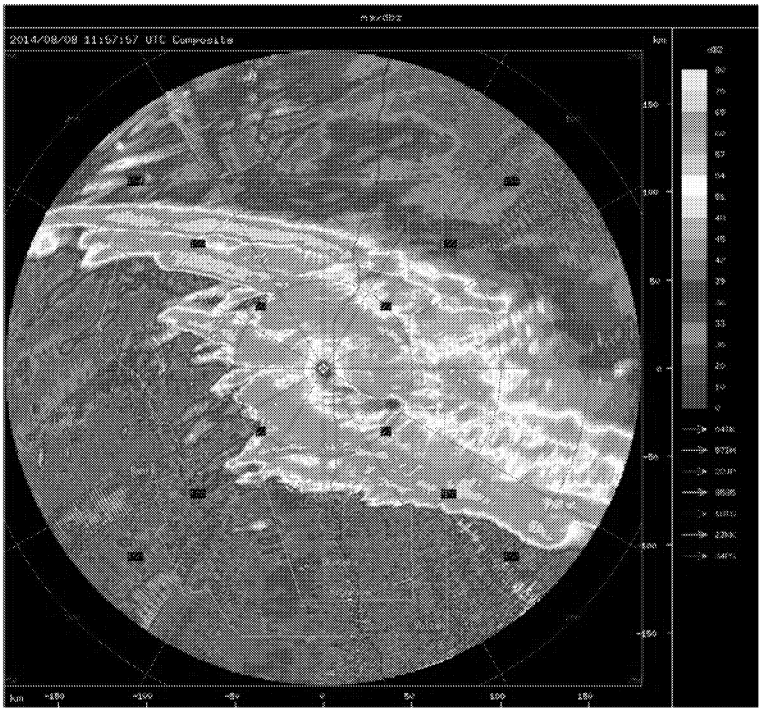


Fig. 51. Composite maximum radar reflectivity plot for the entire storm day of August 7, 2014.

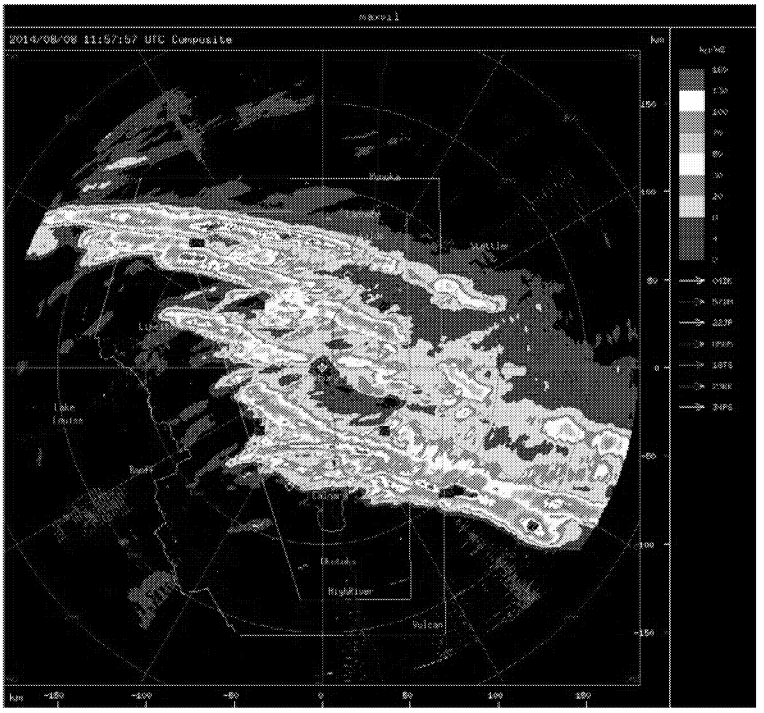


Fig. 52. The maximum vertically-integrated liquid (VIL) measured by the radar is shown. VIL is well-correlated with hail size. For most of the seeded storms, VIL values (and hail size) decreased significantly after the onset of seeding, meaning the hail damage could have been worse, particularly over Red Deer, Innisfail, and Olds. The trend is less obvious over Airdrie. However, VIL values were considerably higher east of Strathmore after seeding ended and the storm reverted to its natural state.

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## 14.0 Climate Perspectives

The daily and accumulated rainfall for Calgary and Red Deer from January 22, 2014 through January 21, 2015 are shown in Figures 53 and 54, respectively. Calgary was near normal until May. Early June was drier than normal, but it became wet from mid-June through mid-July. After that, it was slightly drier than normal through the end of the season. Calgary finished the project (15 September) very near normal.

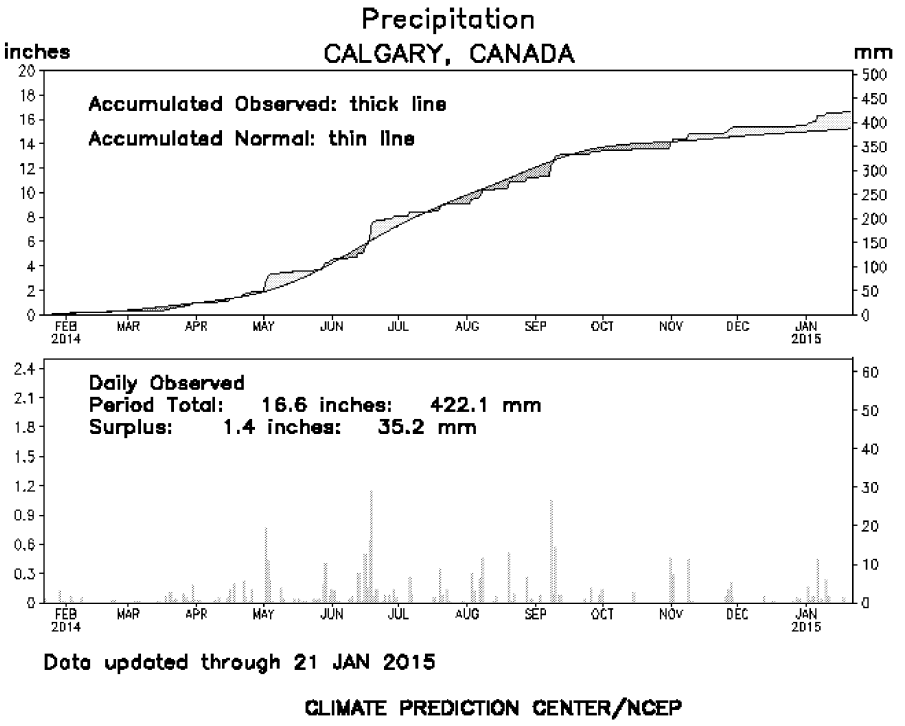


Fig. 53. Daily and accumulated rainfall for Calgary from January 22, 2014 through January 21, 2015.

Conditions became a little wetter than normal in Red Deer beginning in April, but were much wetter than normal in late May, and again in later June. Another wetter-than-normal spurt in mid-July pushed the annual total to about 75-80 mm above normal. Precipitation was normal through the end of the project (September 15), at which time the station was still about 75 mm above average.

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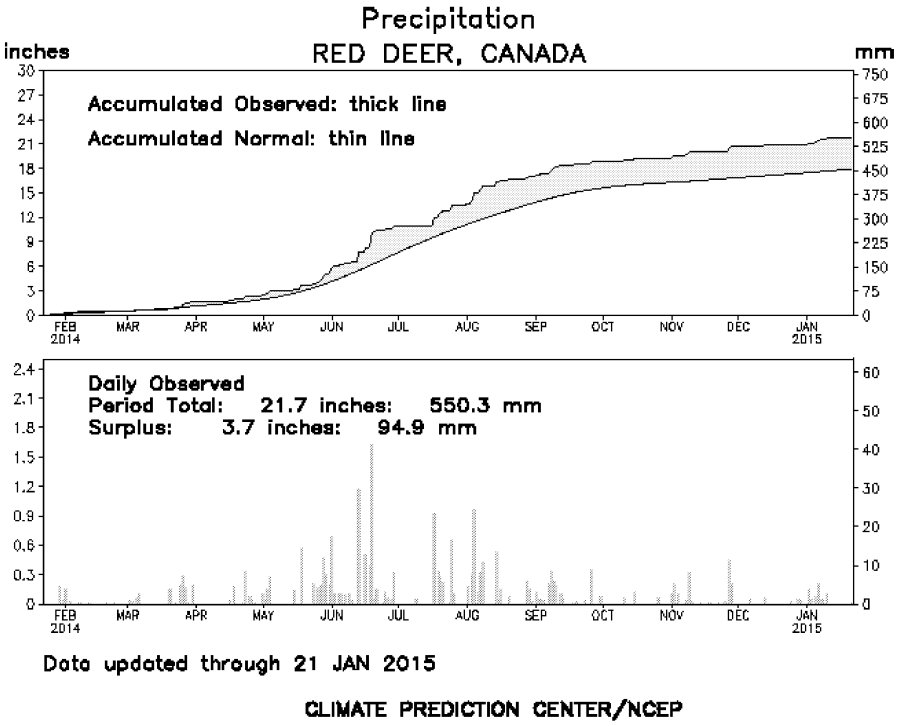


Fig. 54. Daily and accumulated rainfall for Red Deer from January 22, 2014 through January 21, 2015.

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.

Equatorial Pacific Ocean sea surface temperature (SST) anomalies for the period November 2013 to October 2014 are shown in the Figure 55, below (http://www.cpc.ncep.noaa.gov/products/). During January and February, the eastern Pacific SST anomalies were slightly cooler than average while the western Pacific was slightly warm. Average SST anomalies remained Niño neutral for the past year as the anomalies were very weak. During the spring and summer months, SST anomalies transitioned to slightly above average, though remaining technically neutral. The Oceanic Nino Index for the July-September 2014 period was exactly 0.0˚C, or exactly neutral. This means that ENSO had no obvious impact on Alberta weather this summer.

This discussion is a consolidated effort of the National Atmospheric and Oceanic Administration (NOAA), NOAA's National Weather Service, and their funded institutions. Oceanic and atmospheric conditions are updated weekly on the Climate Prediction Center web site (El Niño/La Niña Current Conditions and Expert Discussions).

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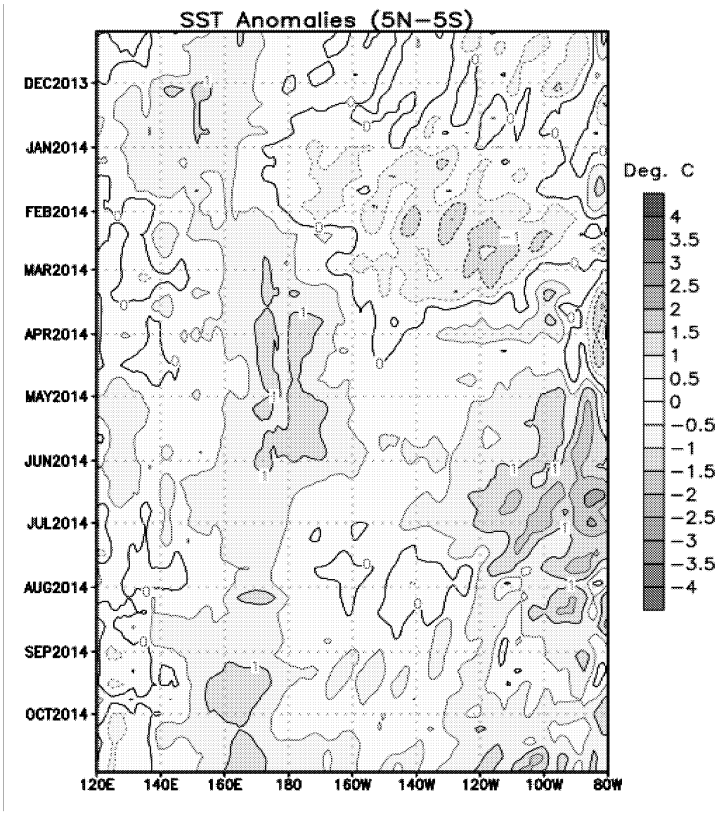
Fig. 55. Pacific Ocean sea surface temperature (SST) anomalies for the period November 2013 to October 2014. For additional information see http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/lanina/enso_evolution-status-fcsts-web.ppt, and http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/enso_update/ssttlon5_c.gif.



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## 15.0 Alberta Crop Hail Insurance Summary

Figure 56 shows the annual Loss-to-Risk ratios for the Province of Alberta as determined by the straight hail crop insurance statistics collected by the Alberta Financial Services Corporation in Lacombe, Alberta. These statistics are for the entire province of Alberta. The average loss-to-risk ratio for the period 1978 to 1995 (before this project began) is 4.3% and the average for the period 1996 to 2014 (the current project period) is 5.7%. In considering these numbers it is important to remember that the AHSP targets only those storms threatening cities and towns in the protected area. Thus, many storms, even those within the protected area but not posing threats to urban areas are not treated. When coupled with the large number of hailstorms that occur within Alberta but outside the protected area, this implies that the frequency of damaging hailstorms is increasing climatologically.

The crop-hail loss data are presented herein exactly for that reason, to provide a baseline of sorts as to the natural frequency of storms, and how that may be changing.

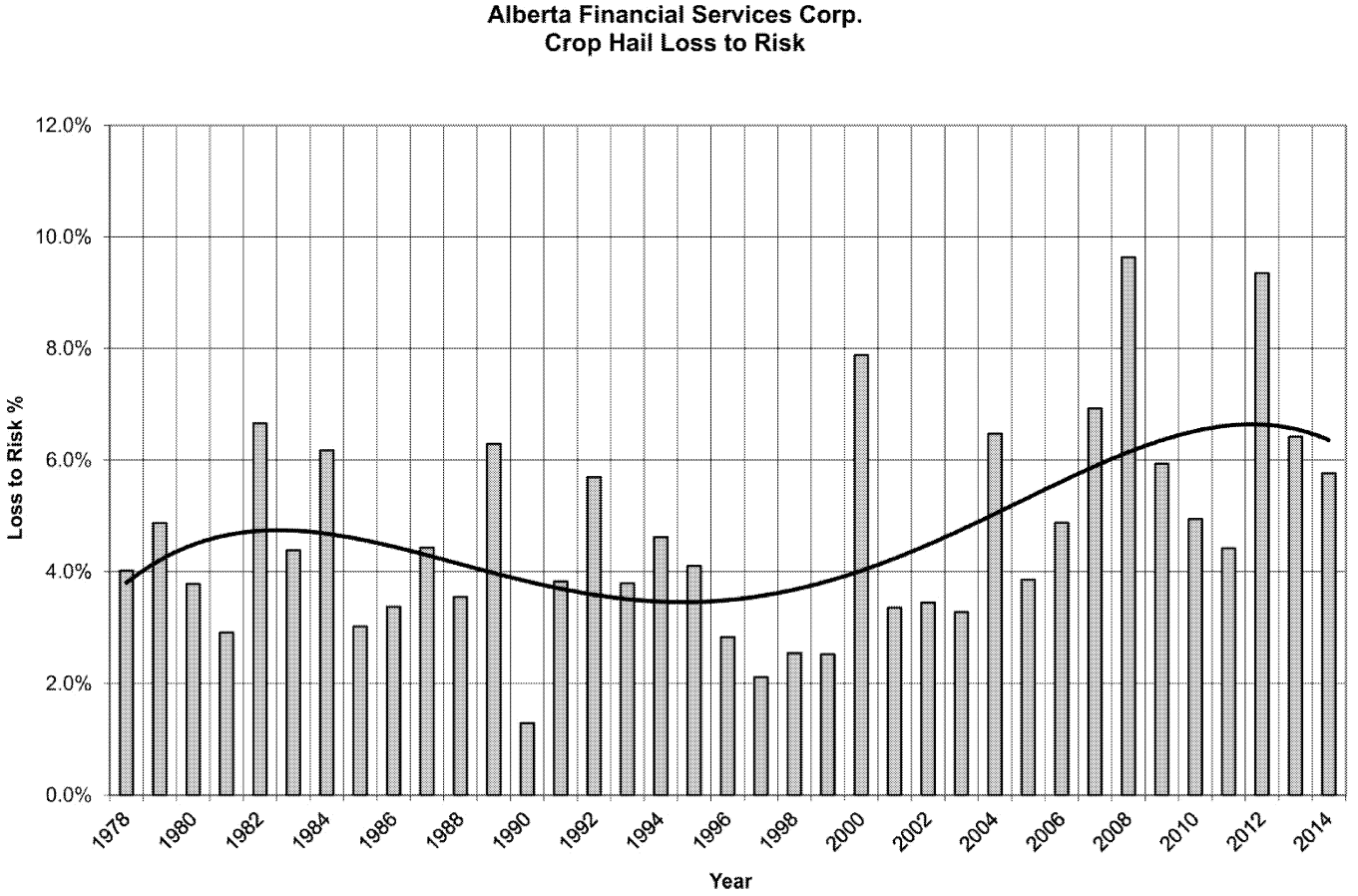


Fig. 56. Alberta Financial Services Corporation straight hail insurance loss-to-risk statistics for the entire Province of Alberta from 1978 through 2014.

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Eight of the first ten years of the project period (1996-2005 inclusive) had below-average crop-hail damage in the province, and the hail damage during 2000 and 2004 appeared as spikes with above-average damage. However, the next 3 years experienced an exponential increase in crop-hail damage. Though followed by a decline in the following three years (2009-2011), all of those years are still well above the long-term climatological mean. In 2012, crop-hail losses spiked again, exceeding 9.3%. Losses in 2013 were 6.4%, not as severe as 2012, but still above the long-term average. This year was a little better, but losses were still high, at 5.8%. These data suggest that the threat of damaging hail storms in Alberta has increased, especially over the past 9 years.

While the area planted each year to crops remains essentially unchanged, the amount of insurance purchased each growing season varies. This depends largely upon the crops planted and growing conditions (anticipated harvests). There has been no marked trend in the last decade in either the dollar amount of insurance sold, nor in the number of acres insured, so the observed trend is not due to either of these.

The property and casualty insurance industry is quite different, however. Each of the companies belonging to the ASWMS considers its premiums and losses to be confidential, and there at present exists no analog to the Alberta Agriculture Financial Services Corporation, so the changes in risk and losses are not known outside each company. However, it is widely acknowledged that with the population growth of southern Alberta has become significantly increased exposure to property. The Calgary metropolitan area has increased dramatically since the program began in 1996, and most other communities have followed suit. It stands to reason that the apparent increase in damaging hailstorms coupled with the dramatically increased urban area demonstrates the need for this program.

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## 16.0 Conclusions

The 2014 field program ran smoothly, without any significant equipment or staffing issues. All storms worthy of treatment were seeded in a timely way. The most significant storm day was August 7, when numerous long-lived supercell storms developed and moved through the protected area, only to have additional several storms form in their wake. A detailed storm summary of this day, in which Airdrie was twice hit by damaging hail, is included in this report. Even though ten storms were recorded over the Calgary metroplex, all were treated effectively; none are known to have produced significant damage.

The fifth aircraft, the third turboprop King Air C90, was a very positive asset to the program this season. The storm frequency and severity was again above normal in 2014; all five aircraft flew operational flights on eleven days during the course of the summer. Having the fifth aircraft available allowed the project Meteorologists to quickly swap top-seeding aircraft without interrupting seeding, by sending the "fresh" top seeder to the cloud system being treated before recalling the first top-seeder. In addition, increased aircraft coverage was possible when multiple or long-lived storms moved through or near a succession of municipalities, such as on August 7th.

The new radar operated very well once the glitches were resolved. Operations were never compromised. The set will be recalibrated prior to the 2015 season, as the season-end calibration (September 2014) indicated that the set was initially calibrated about 3 dB too high.

This was the first season that "double" racks were used on the on-top seeding C90s, allowing more burn-in-place flares to be carried; so many, in fact, that it is unlikely they could all be used during a single flight. This effectively extends the on-station time of the top seeders.

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

December 2014

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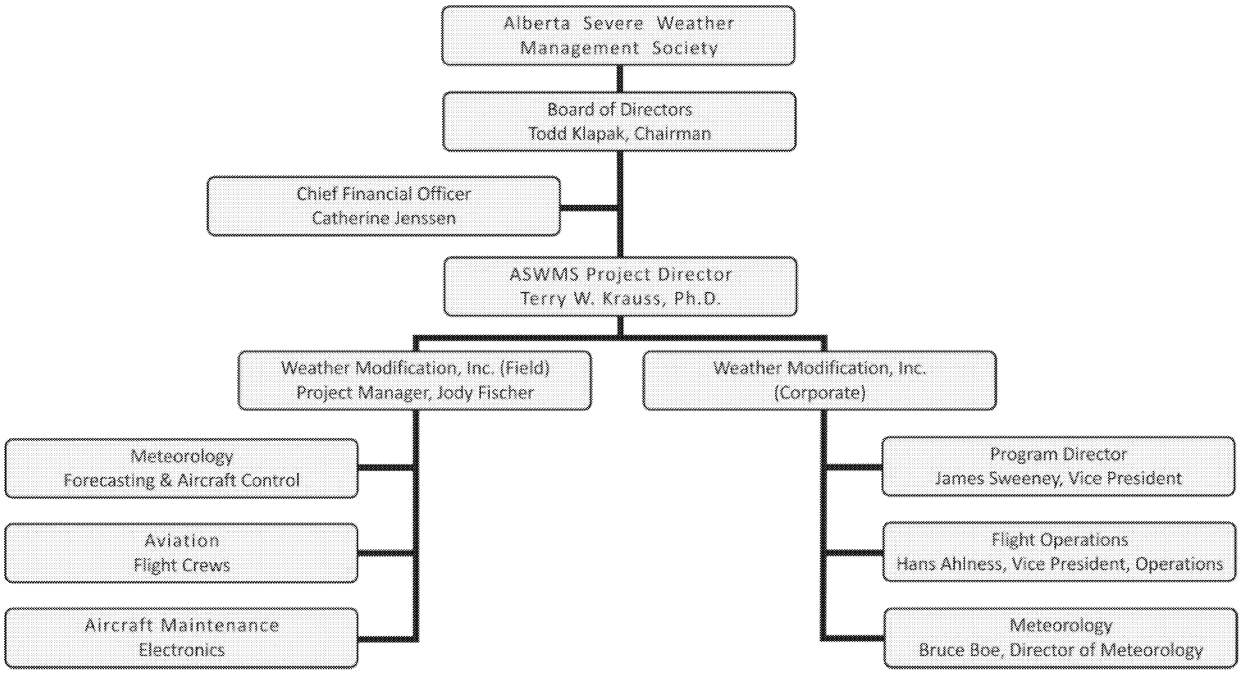
## APPENDIX A – Organization Chart



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APPENDIX B – Daily Weather and Activities Summary Table

**ALBERTA HAIL SUPPRESSION PROJECT 2014**
DAILY SUMMARY REPORTS
WEEK No. 1

| Date | Weather | Activities Summary |
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| June 1, Sunday | The upper level jet was well to the north of AB and was positioned over the Northwest Territories. A midlevel shortwave trough started to slowly push into the area from the west in the afternoon. At the surface, a trough was collocated with the midlevel trough. The 00Z model sounding for Red Deer showed a moderately unstable air mass, but speed shear was expected to be very weak.<br><br>Pulse thunderstorms began developing along the foothills in the early afternoon and slowly moved into the region. These thunderstorms were relatively weak and gradually diminished as they moved eastward across the project area. In the late afternoon, several thunderstorms formed in the eastern half of the area after two outflow boundaries converged. Small hail (roughly 6mm in diameter) was observed in Red Deer during the late afternoon hours.<br><br>Max cell top: 8.5km, 45 max dBz, <30 max VIL<br><br>Tmax YC = 19.7C and 3.6mm of rain.<br>Tmax QF = 20.7C and 17.4mm of rain.<br>Tmax Radar = 19.5C and a trace of rain. | Radar was inoperative due to upgrades to the pedestal and receiver. The project was operational, and backup radar images were provided by Environment Canada's radars.<br><br>No aircraft operations. |
| June 2, Monday | Upper level jet energy remained well north of AB. A small midlevel low began to push into central AB from British Columbia in the morning. This low weakened into a shortwave trough as it pushed into the project area in the afternoon. Both CYQF and CYYC 00Z thermodynamic model soundings showed moderate instability with very weak speed shear.<br><br>Convection developed over the mountains and foothills west of Calgary in the late morning. This convection intensified into weak thunderstorms in the early afternoon before moving into the project area. A small thunderstorm with pea size hail pushed through the town of Sundre at roughly 1930Z. In the evening, a cluster of thunderstorms developed over the Red Deer area. Pea size hail was reported in Red Deer at roughly 0130Z, and hail covered the ground in parts of Red Deer.<br><br>Tmax YC = 19C and 3.2mm of rain.<br>Tmax QF = 21C and 2.8mm of rain.<br>Tmax Radar = 19.6C and 0.3mm of rain. | Radar was inoperative due to upgrades to the pedestal and receiver. The project was operational, and backup radar images were provided by Environment Canada's radars.<br><br>No aircraft operations. |
| June 3, Tuesday | The upper level jet remained well north of the region. No substantial mid-level lifting mechanisms were present. Considerable latent instability did exist, and a weak cold front was forecast to push through the region. | For the first part of the day, TITAN was inoperative due to upgrades to the pedestal and receiver during the morning and afternoon. TITAN images began updating intermittently at |

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| | Convection developed during the early afternoon along the foothills. Cells were slow-moving, and they did not produce significant rain or graupel. Storms gradually moved downslope into the project area in the late afternoon, initiating largely along convective outflow boundaries. They remained relatively weak and did not affect major municipalities. Outflow boundary convergence near Strathmore created weak storms in the eastern buffer zone. Late in the evening, near 0430Z, a tall but brief thunderstorm developed immediately over southern Calgary.<br><br>Max cell top: 11.4 km, 62 max dBz, 67.1 max VIL<br><br>Tmax YC = 22.0C and 0.2mm of rain.<br>Tmax QF = 22.1C and no rain.<br>Tmax Radar = 21.6C and no rain. | 2201Z. Backup radar images were provided by Environment Canada's radars.<br><br>HS5 was launched at 2137Z for new growth northeast of Calgary. They were airborne at 2155Z and started climbing to top seeding altitude. The aircraft then began patrolling west of Strathmore at 2210Z. They RTB at 2302Z. The aircraft landed at 2318Z.<br><br><u>Flight Summary</u><br>HS5: 2142Z-2323Z; no seeding; patrol W of Strathmore. |
| June 4, Wednesday | The nose of the upper level jet entered the western project area during the late evening bringing favorable upper level support for convection. No significant 500mb vorticity advection existed until after a surface front passed through, stabilizing the region. This cold front moved SE through the area from 0-3Z, and provided lift for modest thunderstorms primarily in the north half of the project area.<br><br>Convection began in the northern foothills around 18Z and pushed eastward into the northwest project area. Only weak echoes were reported, with VIL < 10. Weak convection continued until 23Z, when a stronger storm developed on the impending cold front, extending in a SW-NE line. Storms continued to form along the front as it passed through the project area, primarily affecting the northern half of the project area where moisture was more abundant. Cold frontal convection departed the area around 3Z, followed by stratiform rain showers moving through the project overnight.<br><br>Max cell top: 10.6 km, 63 max dBz, 52.3 max VIL<br><br>Tmax YC = 21.9 C and 0.4mm of rain.<br>Tmax QF = 22.2 C and 2.8mm of rain.<br>Tmax Radar = 21.4 C and 2.5mm of rain. | HS4 was launched at 2314Z to an east-southeastward moving storm in the northern buffer zone. The flight became airborne at 2330Z, and the aircraft expedited to a line of storms from Sylvan to Lacombe The crew then started seeding storm #1 NW of Lacombe at 2342Z finding weak inflow. At 0006Z (06/05), HS4 was not finding decent inflow, so they stopped seeding and started patrolling the Red Deer area. Then at 0023Z (06/05) they were only finding downdrafts along the edge of the storm, so the aircraft RTB. HS4 landed at 0030Z (06/05).<br><br><u>Flight Summary</u><br>HS4: 2320Z (06/04)-0035Z (06/05); 48 minutes wing-tip generators; #1 Lacombe, patrol Red Deer. |
| June 5, Thursday | The southern project area resided in the left-entrance region of a 250mb jet streak, precluding deep convection. Mid-level vorticity advection was also neutral to negative. Favorable low-mid level lapse rates provided shallow, capped instability in the project area.<br><br>Scattered weak, low-topped rain showers were observed across much of the project area from the afternoon through the overnight hours. No lightning or hail was reported.<br><br>Max cell top: 4.6 km, 52 max dBz, 5.9 max VIL<br><br>Tmax YC = 13.5 C and a trace of rain. | No aircraft operations. |

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| | Tmax QF = 11.5 C and 2.6mm of rain.<br>Tmax Radar = 11.1C and 2.8mm of rain. | |
| June 6, Friday | The left exit region of upper level jet passed through the southern project area in the late afternoon. 500mb cyclonic vorticity advection provided lift for convection during the overnight hours. Very dry air resided at the surface and low levels, with surface dew points < 0C. Modest instability existed due to cold temperatures aloft. However, convection was significantly hindered by the dry surface conditions.<br><br>Fair weather cumulus over the foothills gently transitioned to weak rain showers during the late afternoon. More substantial thundershowers developed in the northern project area overnight when midlevel vorticity advection forced the development of elevated convection. There were no hail threats.<br><br>Tmax YC = 15.9C and no rain.<br>Tmax QF = 15.3C and a trace of rain.<br>Tmax Radar = 15.1C and 0.3mm rain. | No aircraft operations. |
| June 7, Saturday | Upper level jet energy remained south of the project area. Vorticity advection was negligible across the project area, and no significant synoptic features produced lift for convection. Weak instability existed across the area, and slope-valley flow allowed foothills convection to develop during the late afternoon and evening.<br><br>Scattered convection moved off the foothills through the northern half of the project area during the mid-afternoon and evening. No cells breached hail criteria according to RADAR indicated VIL values. Thunder and lightning accompanied the strongest storms, but no hail was reported.<br><br>Max cell top: 8.4 km, 55.4 max dBz, 18.4 max VIL<br><br>Tmax YC = 18.8C and no rain.<br>Tmax QF = 17.6C and 2.4mm of rain.<br>Tmax Radar = 17.7C and no rain. | No aircraft operations. |
| June 8, Sunday | Jet energy was directly over central AB. A shortwave midlevel ridge was in place over most of AB during the morning and afternoon. This ridge then quickly flattened in the evening as a trough began to move eastward into British Columbia. Weak to modest vorticity advection occurred in the evening and overnight. An 850mb theta-e ridge aided in keeping the atmosphere slightly unstable during the nighttime hours. At the surface, a low pressure system started to make its way into the area during the overnight hours.<br><br>Light convective rain showers fell near Rocky MH and Sundre in the afternoon and evening. Overnight, moderate rain showers were observed over the northwestern part of the project area. No lightning strikes occurred inside the protected area. | No aircraft operations. |

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| | Max cell top: 5.4km, 49.9 max dBz, 5.0 max VIL<br><br>Tmax YC = 21.7C and no rain.<br>Tmax QF = 21.3C and no rain.<br>Tmax Radar = 21.4C and no rain. | |
| June 9, Monday | The upper level jet was over southern AB. A strong midlevel trough was over central AB during the morning and afternoon hours. Moderate to strong vorticity advection was expected during the afternoon hours. A cold front pushed southeastward through the project area during the morning and afternoon. Model soundings for 18Z indicated that the atmosphere would be moderately unstable with around 40 kts of effective bulk shear.<br><br>Convective rain showers occurred in the early morning. Thunderstorms then started forming along the foothills in the late morning as a cold front pushed southeastward across the region. The cold front continued to trigger thunderstorms as it moved southeastward. A couple waves of moderate to strong thunderstorms then moved across the entire project area in the afternoon and evening. Radar data indicated that walnut size hail may have fallen between the cities of Calgary and Okotoks at roughly 21Z. Atmospheric conditions were relatively stable during the overnight hours.<br><br>Dime size hail was reported in Red Deer, and ice pellets fell in Calgary.<br><br>Max cell top: 9.9km, 65.5 max dBz, 75.1 max VIL<br><br>Tmax YC = 16.7C and 0.8mm of rain.<br>Tmax QF = 15.3C and no precip data.<br>Tmax Radar = 14.6C and a trace of rain. | HS1 was launched to patrol over the Turner Valley area at 1834Z. The flight became airborne at 1853Z and began patrol over Turner Valley. Then at 1903Z HS1 repositioned to the Sundre area. Upon arriving at the storm, they started seeding storm #1 near Didsbury at 1920Z. HS1 then stopped seeding storm #1 at 1928Z in order to reposition to new convective growth west of the Cochrane area. At 1935Z, they started patrolling the Cochrane area. HS1 then started seeding storm #2 west of Cochrane at 2000Z. At 2038Z, HS1 repositioned to a more intense storm NW of Okotoks. The flight then started seeding this storm (#4) at 2044Z. They continued seeding as the storm approached the Okotoks area. They then stopped seeding and RTB at 2113Z. The aircraft landed at 2124Z.<br><br>HS3 was launched at 1915Z to convective cells west of Rocky MH. The flight became airborne at 1940Z. The flight then started patrolling west of Sylvan at 1945Z. They were repositioned to NW of Sundre at 2012Z. Then at 2020Z HS3 started seeding storm #3 for Sundre. They then stopped seeding at 2039Z and started patrolling for the town of Olds. At 2049Z, storm #3 was starting to approach the town of Innisfail, so they resumed seeding. The aircraft then repositioned to the north of Eckville at 2115Z and then started seeding storm #5 at 2120Z for Red Deer. At 2138Z they descended to shed ice from the aircraft but continued seeding using BIP flares during descent. The crew then started base seeding at 2140Z for the same storm (#5). They stopped seeding and RTB at 2208Z. The aircraft landed at 2209Z.<br><br>HS5 was launched at 2033Z to a cluster of convective growth NW of Okotoks. The aircraft was airborne at 2052Z and climbed to the base seeding altitude. They then started patrolling for Okotoks at 2109Z. HS5 started climbing to cloud top at 2113Z but did not find any new development. At 2137Z, HS5 repositioned to YBW for patrol. They RTB at 2149Z. The aircraft landed at 2159Z.<br><br><u>Flight Summary</u><br>HS1: 1844Z-2127Z; 103 EJ, 11 BIP; #1 Didsbury, #2 Cochrane; #4 Okotoks, patrol Turner Valley.<br>HS3: 1925Z-2215Z; 228 EJ, 18 BIP; #3 Sundre |

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| | | to Innisfail, #5 Red Deer, patrol Sylvan.<br>HS5: 2040Z-2203Z; no seeding; patrol Okotoks, patrol YBW. |
| June 10, Tuesday | Jet energy was mainly south of the international border for most of the day and night. An open wave low was centered over Manitoba, and a trough extended to the southwest from the low into southern AB. Lobes of vorticity were co-located with the trough and were the main trigger mechanism for thunderstorm development. Low level and surface winds were out of the north to northwest. Area model thermodynamic soundings suggested that the atmosphere would be moderately unstable with weak speed shear.<br><br>Isolated convective rain showers fell over the northern part of the area in the morning and early afternoon. In the late afternoon convection initiated over parts of the foothills. This convection gradually intensified and started pushing into the project area at roughly 23Z. A few clusters of thunderstorms then moved eastward across the region. Radar data indicated that grape size hail may have fallen east of the town of Crossfield. The thunderstorm activity lasted until the late evening hours. Convective rain showers then occurred overnight.<br><br>Max cell top: 9.9km, 61.9 max dBz, 38.0 max VIL<br><br>Tmax YC = 18.6C and 1.8mm of rain.<br>Tmax QF = 17.5C and 1.0mm of rain.<br>Tmax Radar = 17.3C and 6.6mm of rain. | HS2 was launched at 0058Z (06/11) to a line of cells located from near Olds to Airdrie. The aircraft was airborne at 0112Z (06/11). They began patrol west of Olds at 0131Z (06/11) and began seeding storm #1 NW of Didsbury at 0139Z (06/11). HS2 then moved to a convective line SE of Didsbury at 0200Z (06/11), and began seeding storm #2 for the Irricana-Strathmore area. They RTB at 0255Z (06/11). The aircraft landed at 0315Z (06/11).<br><br><u>Flight Summary</u><br>HS2: 0105Z (06/11)-0319Z (06/11); 150 minutes wing-tip generators, 5 BIP; #1 Didsbury, #2 Irricana to Strathmore, patrol Olds to Airdrie. |
| June 11, Wednesday | The right entrance region of an upper level jet streak was over southern AB during the daytime hours. A wave of vorticity moved southeastward across the region in the morning and early afternoon. The main trigger mechanism for thunderstorms was elevated surface heating along the foothills. A weak midlevel ridge built over southern AB but did not appear to be strong enough to inhibit deep convection. 500mb temperatures were expected to warm by approximately 1.5C throughout the daytime hours. Surface winds were out of the southeast and light.<br><br>Light convective rain showers occurred over the Three Hills area in the morning. In the afternoon, convection started forming over the foothills. This convection eventually developed into weak thunderstorms. One storm moved into the project area west of Cremona before dissipating. Another relatively weak storm moved into the project area NW of Cochrane. This storm produced convective rain showers over Cochrane and western Calgary. Lightning was observed west of Cremona and NW of Cochrane.<br><br>Max cell top: 7.6km, 56.2 max dBz, 15.0 max VIL<br><br>Tmax YC = 17.3C and no rain.<br>Tmax QF = 17.2C and a trace of rain.<br>Tmax Radar = 17.3C and no rain. | No aircraft operations. |

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| June 12, Thursday | Upper level jet energy was centered along the far southeastern part of AB. The closed low was now over the Seattle area and was expected to start nosing its way into southern AB during the overnight hours. The midlevel flow was southwesterly, and several lobes of vorticity moved through during the forecast period. An 850mb theta-e ridge was in place over southern AB during the overnight hours. At the surface, upslope conditions occurred in the evening and overnight. The troposphere was unstable, but a moderately strong cap existed at the low levels through the early evening.<br><br>The region saw thin stratiform cloud cover in the morning. Fair weather cumulus clouds were then seen over the northern half of the region in the early afternoon. Isolated convective rain showers fell over the area in the late afternoon and early evening. Thunderstorms developed in the late evening and continued to move northward across the entire project area during the overnight hours. Radar data indicated that pea size hail may have fallen just to the east of Okotoks during the overnight hours.<br><br>Max cell top: 9.1km, 57.7 max dBz, 26.0 max VIL<br><br>Tmax YC = 20.5C and 0.4mm of rain.<br>Tmax QF = 20.9C and no rain.<br>Tmax Radar = 19.9C and 0.8mm of rain. | No aircraft operations. |
| June 13, Friday | An upper level jet streak was southeast of the region. A closed mid and upper low was centered over the Alberta/Montana border. Several lobes of vorticity rotated around the low and moved across the area. Enhanced water vapor imagery showed a dry slot over the southern project area during the morning and afternoon. Upslope flow was present at the low levels. Model soundings for 00Z showed around 300 J/kg of CAPE with weak speed shear.<br><br>Embedded thunderstorms formed near the Three Hills area in the morning. The rest of the region experienced stratiform rain showers during the morning. In the early afternoon, embedded convection and stratiform rain showers continued over the NW part of the project area. The late afternoon and evening then saw convective rain showers and thunderstorms. Radar data suggested that pea size hail may have fallen east of the town of Caroline.<br><br>Max cell top: 7.6km, 58.7 max dBz, 22.6 max VIL<br><br>Tmax YC = 12.5C and 7.8mm of rain.<br>Tmax QF = 15.4C and 30.0mm of rain.<br>Tmax Radar = 12.8C and 14.5mm of rain. | No aircraft operations. |
| June 14, Saturday | Upper level jet energy continued to be well to the southeast of the area. The mid and upper level low was now centered over the far southwestern part of Saskatchewan and was expected to slowly move eastward throughout the period. Vorticity advection was weak. The low levels of the atmosphere were moist. | No aircraft operations. |

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| | Area model thermodynamic soundings indicated that moderately strong pulse thunderstorms were a possibility.<br><br>Light convective rain showers fell over the southeastern part of the project area in the morning. Thunderstorms developed over the northern foothills during the afternoon. These storms were initially stationary and remained primarily over the mountains. Then in the late afternoon, these thunderstorms began to push into the western half of the project area. This convection lingered over the region into the evening hours and produced convective rain showers.<br><br>Max cell top: 9.9km, 57.1 max dBz, 12.7 max VIL<br><br>Tmax YC = 17.3C and a trace of rain.<br>Tmax QF = 18.1C and no rain.<br>Tmax Radar = 16.9C and no rain. | |
| June 15, Sunday | Jet energy resided well south of project area. Weak midlevel flow resulted in very weak vorticity advection. At the surface, a weak lee trough developed and focused most of the afternoon convective threat west of the project border.<br><br>Convective thundershowers developed in the project area in the mid-afternoon. Storms were weak without a significant hail threat. However, one storm northwest of Olds briefly produced a VIL indicative of small hail. Later in the afternoon, storms favored the foothills and southwest region of the project. They were not hail threats. Thunderstorms transitioned to rain showers overnight, bringing 0-3mm of rain to the region. Radar indicated pea size hail was possible northwest of Olds.<br><br>Max cell top: 6.9 km, 58.8 max dBz, 21.6 max VIL<br><br>Tmax YC = 14.9C and 0.2mm of rain.<br>Tmax QF = 18.0C and no rain.<br>Tmax Radar = 14.4C and 1.0mm of rain. | No aircraft operations. |
| June 16, Monday | Upper-level jet energy remained well to the south of the project area. Flow in the midlevels remained weak. Vorticity advection was limited. Low-level cloudiness lingered across much of the project area hindering broad-scale daytime heating. However, pockets of clearing were expected to create some isolated areas of enhanced CAPE and weak thundershowers.<br><br>Rain showers slowly moved NE throughout the afternoon. In the late afternoon, radar data indicated a marginal hail threat in the Turner Valley and Okotoks region. No hail was reported. Steady rain occurred throughout the night. Radar indicated pea size hail was possible west of High River.<br><br>Max cell top: 9.1 km, 60.3 max dBz, 28.6 max VIL<br><br>Tmax YC = 14.8 C and 15.7mm of rain.<br>Tmax QF = 14.3 C and 12.6mm of rain. | HS5 was launched at 2129Z to patrol intensifying convection in the southwest buffer. The flight became airborne at 2148Z and patrolled the Turner Valley region. They began seeding storm #1 Turner Valley and Okotoks at 2217Z. The storm of concern weakened considerably as it approached Okotoks, and seeding ceased at 2307Z. HS5 continued to patrol as the dying convection approached Calgary, then RTB at 2325Z. The aircraft landed at 2334Z.<br><br>Flight Summary<br>HS5: 2137Z-2337Z; 38 EJ, 8 BIP; #1 Turner Valley and Okotoks. |

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| | Tmax Radar = 12.6 C and 9.1mm of rain. | |
| June 17, Tuesday | The jet stream remained well to the south of the project area. A closed 500mb low drifted eastward through Montana, bringing modest pulses of vorticity advection and easterly flow to the project region. There were no significant surface fronts in the project area, although flow was upslope with northeasterly surface winds.<br><br>Rain showers pushed through the southern half of the project area from mid-afternoon through the evening. A few convective showers were embedded in the larger rain mass, but they were not a hail concern. No lightning occurred.<br><br>Max cell top: 5.4 km, 46.6 max dBz, 5.1 max VIL<br><br>Tmax YC = 14.2 C and 4.0mm of rain.<br>Tmax QF = 16.5 C and no rain.<br>Tmax Radar = 15.3 C and 1.8mm of rain. | No aircraft operations. |
| June 18, Wednesday | Jet energy was positioned south of project area. A closed 500mb low in north central MT was shifting slowly NE, bringing easterly flow to the area. Several pulses of vorticity advection were expected to rotate around the circulation through the project area. Poor instability and abundant cloud cover would preclude deep convection.<br><br>Several rounds of moderate rain showers pushed across the entire project area in the mid-afternoon through the following morning. All activity stayed well below hail criteria. No lightning occurred.<br><br>Max cell top: 6.9 km, 54.2 max dBz, 7.6 max VIL<br><br>Tmax YC = 12.9 C and 16.4mm of rain.<br>Tmax QF = 17.5 C and 9.8mm of rain.<br>Tmax Radar = 15.9 C and 10.7mm rain. | HS1 performed a maintenance flight. They took off at 1832Z and landed at 1902Z.<br><br>HS2 performed a maintenance flight. They took off at 1905Z and landed at 1924Z.<br><br>HS4 performed a maintenance flight. They took off at 2129Z and landed at 2145Z.<br><br>Flight Summary<br>HS1: 1819Z-1905Z; no seeding; maintenance flight.<br>HS2: 1851Z-1927Z; no seeding; maintenance flight.<br>HS4: 2120Z-2151Z; no seeding; maintenance flight. |
| June 19, Thursday | The project area was in the left entrance region of a modest jet streak. The 500mb closed low was located in extreme SE Alberta. Several moderate lobes of vorticity were expected to pass through the project area. By the early evening, clearing was expected over the east-central region of the project area, which would provide some modest instability late in the afternoon. No significant hail threats were forecast.<br><br>Rain showers gradually weakened across the project area throughout the afternoon. Isolated convection fired in the far eastern project area during the early evening which briefly pulsed to a minor hail threat. This was the only region of significant convection during the period. Radar indicated grape sized hail may have occurred west of Linden.<br><br>Max cell top: 7.6 km, 63.6 max dBz, 43.8 max VIL<br><br>Tmax YC = 17.1 C and 29.2mm of rain.<br>Tmax QF = 17.2 C and 41.2mm of rain. | No aircraft operations. |

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| | Tmax Radar = 16.5 C and 30.0mm of rain. | |
| June 20, Friday | The upper level jet stream was not located near the project area. A modest area of vorticity was expected during the overnight hours. Upper level temperatures would be cooling considerably throughout the forecast period, enhancing instability and hail potential. Wind shear was weak, keeping storm motion slow and precluding organized updrafts. A weak cold front was expected to slide eastward through the region during the evening.<br><br>Convection initiated along the western project boundary between 20-21Z. Convection became more significant in the northwest quadrant of the project area by 22Z, when cell tops approached 10km and radar indicated the threat of small hail. Thunderstorms continued to increase in coverage and intensity through the 22Z-02Z period. Convection gradually pushed east through the late evening into the night. Storms became weak and elevated after sunset. Widespread rain occurred through the night with no hail threat. An 11.4km TITAN cell was observed over SW Calgary. Pea sized hail was reported in southwest Calgary. Radar indicated that brief walnut size hail may have occurred east of Lacombe in the buffer zone.<br><br>Max cell top: 11.4 km, 65.6 max dBz, 82.1 max VIL<br><br>Tmax YC = 23.4 C and 1.8mm of rain.<br>Tmax QF = 22.6 C and 1.4mm of rain.<br>Tmax Radar = 22.8 C and 7.9mm of rain. | HS3 performed a maintenance flight after briefing. They took off from YQF at 1832Z and landed at 1845Z.<br><br>HS2 was launched at 2050Z for growing convection immediately west of Calgary. They took off at 2107Z and began patrolling the storm at 2113Z. The storm did not become a hail threat. HS2 then RTB at 2131Z, and landed at 2145Z.<br><br>HS2 was re-launched at 2212Z for stronger development near Sundre and Caroline. They were airborne at 2230Z and began patrolling south of Sundre at 2240Z. At 2252Z they repositioned to Rocky Mountain House, and at 2308Z began base seeding storm #1 Rocky Mountain House, where convection was developing west of town. At 2332Z, HS2 repositioned south toward Sundre leaving generators on in transit. They found suitable inflow and began seeding storm #2 Sundre at 2347Z. At 2355Z, HS2 repositioned a short distance and began seeding storm #3 Didsbury. HS2 RTB at 0119Z (06/21). They landed at 0135Z (06/21).<br><br>HS1 was launched at 0000Z (06/21) for new convective growth west of Calgary. At 0010Z (06/21) HS1 was airborne and began patrolling for Calgary. HS1 began top seeding storm #5 Calgary at 0101Z (06/21). At 0253Z (06/21) HS1 repositioned to storm #6 Calgary, and began started seeding at 0257Z (06/21). HS1 RTB at 0342Z (06/21), and landed at 0353Z (06/21).<br><br>HS3 was launched at 0012Z (06/21) for developing cells NE of Sundre. They were airborne at 0024Z (06/21) and began top seeding storm #4 Innisfail at 0031Z (06/21). HS3 stopped seeding at 0123Z (06/21). They RTB at 0128Z (06/21). HS3 landed at 0136Z (06/21).<br><br>HS4 was launched at 0025Z (06/21) to convection NW of Olds. They were airborne at 0044Z (06/21) and began base seeding storm #4 Innisfail at 0100Z (06/21). At 0117Z (06/21) HS4 stopped seeding and repositioned to join HS1 on storm #5 Calgary. They began seeding at 0144Z (06/21). At 0218Z (06/21) HS4 repositioned a few miles to the SW and began seeding storm #6 Calgary at 0225Z (06/21). They continued seeding the storm as it neared Strathmore. HS4 stopped seeding and RTB at 0404Z (06/21) as they were replaced by HS2 SW of Strathmore. They landed at 0434Z |

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| | | (06/21).<br><br>HS5 launched at 0307Z (06/21) to replace HS1 on convection over Calgary. They were airborne at 0326Z (06/21) and proceeded to storm #6 where HS1 was already top-seeding. HS5 took over top seeding as HS1 departed, beginning at 0347Z (06/21). As the storm approached Strathmore, they stopped seeding and started patrolling at 0428Z (06/21). At 0439Z (06/21) the convective cells near Strathmore were continuing to diminish, so the aircraft stopped patrolling and RTB. They landed at 0455Z (06/21).<br><br>HS2 launched at 0317Z (06/21) for convective growth near Springbank. They were airborne at 0332Z (06/21). HS2 began seeding storm #7 Calgary at 0338Z (06/21). At 0349Z (06/21), HS2 repositioned east of Calgary leaving generators on in transit. They began seeding storm #6 west of Strathmore at 0404Z (06/21). At 0415Z (06/21) HS2 was finding no significant inflow and no seedable base, so they RTB. The aircraft landed at 0434Z (06/21).<br><br>Flight Summary<br>HS3: 1824Z-1850Z; no seeding; maintenance flight.<br>HS2: 2100Z-2150Z; no seeding; patrol Calgary.<br>HS2: 2215Z-0140Z (06/21); 260 minutes wing-tip generators, 21 BIP; #1 Rocky Mountain House, #2 Sundre, #3 Didsbury.<br>HS1: 0005Z (06/21)-0405Z (06/21); 284 EJ, 25 BIP; #5 Calgary, #6 Calgary.<br>HS3: 0019Z (06/21)-0142Z (06/21); 135 EJ, 12 BIP; #4 Innisfail.<br>HS4: 0034Z (06/21)-0435Z (06/21); 314 minutes wing-tip generators, 5 BIP; #4 Innisfail, #5 Calgary, #6 Calgary to Strathmore.<br>HS5: 0315Z (06/21)-0504Z (06/21); 76 EJ, 2 BIP; #6 Calgary to Strathmore<br>HS2: 0320Z (06/21)-0440Z (06/21); 74 minutes wing-tip generators, 3 BIP; #7 Calgary, #6 Strathmore. |
| June 21, Saturday | An upper level ridge would be moving across the project area during the afternoon and evening. This would provide a strong cap, hindering daytime convection. At the surface, northwesterly flow was bringing cooler and drier air into the region. Weak convective showers were forecast.<br><br>Morning rain showers dissipated and departed the project area at 1900Z. Very little daytime convection occurred, including over the foothills. Weak echoes began to appear around 2Z, and a few minor rain showers moved through the western project area overnight. There was no lightning observed. | No aircraft operations. |

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| | Max cell top: 5.4 km, 56.6 max dBz, 8.7 max VIL<br><br>Tmax YC = 18.5 C and 3.4mm of rain.<br>Tmax QF = 18.0 C and 3.8mm of rain.<br>Tmax Radar = 17.3 C and 14.0mm of rain. | |
| June 22, Sunday | Upper level jet energy was well to the northwest of Alberta. A midlevel open wave low was centered along the SK/MB border. Central AB had relatively light northwesterly flow aloft. As a result, speed shear was weak. Vorticity advection was expected to be weak. 850mb theta-e ridging was present over the foothills and mountains of BC and AB. Surface winds were light and out of the east to northeast. The troposphere was slightly to moderately unstable, but a strong cap was in place over the northeastern part of the project area.<br><br>The project area saw mostly clear skies during the morning, afternoon, and evening. Convective rain showers were then observed near the Sundre area at around 06Z. No lightning strikes occurred within the project area.<br><br>Max cell top: 6.9km, 55.2 max dBz, 9.6 max VIL<br><br>Tmax YC = 21.4C and no rain.<br>Tmax QF = 21.0C and no rain.<br>Tmax Radar = 20.9C and no rain. | No aircraft operations. |
| June 23, Monday | Jet energy at the upper levels continued to be well to the northwest of AB. A midlevel ridge was centered along the AB/SK border, and a trough was in place along the coast of BC. This resulted in weak southwesterly flow over central AB. Effective bulk shear was around 10 kts. Surface winds were out of the southeast and light. Model soundings indicated that the atmosphere would be moderately unstable.<br><br>Weak convection initiated along the foothills in the morning. The convection eventually developed into thunderstorms at around 18Z. A few of these storms moved into the region near Sundre and southwest of Calgary in the afternoon. Radar data suggested that pea size hail may have fallen west of Cremona. In the evening, isolated convective rain showers occurred over the southern part of the project area. No significant weather occurred overnight.<br><br>Max cell top: 6.9km, 59.9 max dBz, 22.4 max VIL<br><br>Tmax YC = 22.7C and no rain.<br>Tmax QF = 23.2C and no rain.<br>Tmax Radar = 22.1C and no rain. | A radar tour was conducted at the Olds-Didsbury airport with 18 people attending.<br><br>HS1 flew a PR flight. The aircraft was airborne out of YBW at 1719Z and landed in EA3 at 1732Z.<br><br>HS1 then flew a return PR flight. The aircraft was airborne out of EA3 at 2247Z and landed in YBW at 2300Z.<br><br>Flight Summary<br>HS1: 1701Z-1736Z; no seeding; PR flight; takeoff YBW, land EA3.<br>HS1: 2231Z-2302Z; no seeding; PR flight; takeoff EA3, land YBW. |
| June 24, Tuesday | Upper level jet energy was over BC during the daytime hours. Overnight, the jet shifted eastward into the area. A midlevel trough was over BC. The axis of this trough began to move over the region during the overnight hours. Vorticity advection was expected to be strongest during the evening and overnight hours. A well-defined | HS4 flew a reposition flight from YQF to Rocky MH. The flight was airborne at 2242Z and landed at 2302Z.<br><br>HS2 was launched at 2246Z to new convective development directly over Calgary. The aircraft |

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| | 850mb theta-e ridge remained in place over the southern half of AB through the night. At the surface, a lee trough developed over the area. Modified model soundings were showing anywhere from 800 to 1050 J/kg of CAPE for the late afternoon and evening, but the shear was expected to be weak.<br><br>Towering cumulus clouds started forming over the foothills in the late morning. At around 18Z, convective cells formed to the west of Calgary. Additional convection formed southwest of Calgary and tried to push into the protected area. These storms initially diminished as they moved eastward off the foothills. Later in the afternoon, the storms began pushing into the project area. Storm #1 developed directly over southwestern Calgary and moved north-northeastward across the city. This same storm weakened before moving through Airdrie and Crossfield. A line of thunderstorms then developed from Olds to Strathmore. This line of thunderstorms (storms #2 and #3) pushed northward across most of the northeastern part of the project area during the early evening. The next wave of convection moved northward across the area during the late overnight hours.<br><br>Penny size hail was reported in downtown Calgary.<br><br>Max cell top: 12.1km, 66.2 max dBz, 83.5 max VIL<br><br>Tmax YC = 24.1C and 0.2mm of rain.<br>Tmax QF = 24.1C and 0.2mm of rain.<br>Tmax Radar = 23.4C and 0.3mm of rain. | was airborne at 2307Z. HS2 then started seeding storm #1 at 2319Z as the cluster of cells moved across Calgary. They stopped seeding at 2332Z and started patrolling the Crossfield area. The flight then stopped patrolling and RTB at 2350Z. They landed at 0001Z (06/25).<br><br>HS5 was launched at 2246Z to growing convection directly over Calgary. The aircraft was airborne at 2314Z. HS5 started patrolling the Airdrie and Crossfield area starting at 2332Z. They were then redirected to a new convective TITAN cell east of the Olds area at 0013Z (06/25). HS5 started seeding storm #2 at 0017Z (06/25) south of Innisfail. The crew continued to seed the storm as it pushed northward towards Innisfail. Then at 0051Z (06/25) they stopped seeding and started descending to shed ice. At 0101Z (06/25) the aircraft started climbing back up to the top seeding altitude. Then at 0107Z (06/25) HS5 started seeding storm #2 for Red Deer. The aircraft repositioned to a different TITAN cell southeast of Red Deer at 0119Z (06/25) and started seeding this storm (#3) at 0126Z (06/25) for the Red Deer area. Then at 0158Z (06/25) the crew was finding no new growth along the storm, so they stopped seeding and RTB. The aircraft landed at 0233Z (06/25).<br><br>HS4 was launched out of Rocky MH at 0017Z (06/25) for a storm (#2) moving towards Innisfail. The flight became airborne at 0025Z (06/25). Upon arriving at the storm (#2), they started patrolling the Innisfail area at 0048Z (06/25). HS4 then started seeding storm #3 at 0103Z (06/25) for Red Deer. The crew continued seeding the storm as it approached the Red Deer area from the south. At 0133Z (06/25) HS4 repositioned to storm #2. The aircraft started seeding this storm (#2) at 0140Z (06/25) for the town of Bentley. HS4 then stopped seeding and RTB at 0151Z (06/25). They landed in YQF at 0213Z (06/25).<br><br>Flight Summary<br>HS4: 2232Z-2308Z; no seeding; reposition flight; takeoff YQF, land Rocky MH.<br>HS2: 2300Z (06/24)-0005Z (06/25); 26 minutes wing-tip generators, 1 BIP; #1 Calgary, patrol Crossfield.<br>HS5: 2300Z (06/24)-0235Z (06/25); 189 EJ, 8 BIP; #2 Innisfail to Red Deer, #3 Red Deer, patrol Crossfield.<br>HS4: 0020Z (06/25)-0218Z (06/25); 96 minutes wing-tip generators, 3 BIP; #3 Red Deer, #2 Bentley, patrol Innisfail; takeoff Rocky MH, land YQF. |

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| June 25, Wednesday | A westerly jet was positioned along the Alberta/Montana border. The jet was expected to shift northward throughout the forecast period. A midlevel trough with strong vorticity advection slid northeastward across the area in the morning and afternoon. A surface trough was co-located with the midlevel trough. The main trigger for thunderstorms during peak heating was elevated surface heating along the foothills. Modified model soundings for the region suggested that the troposphere would be slightly to moderately unstable with around 20 kts of bulk shear.<br><br>Thunderstorms began to push into the Cochrane area during the early morning hours. These storms moved northeastward across the entire protected area. Radar data indicated that the strongest of these thunderstorms may have produced grape size hail southwest of Three Hills during the midmorning hours. Scattered convective rain showers were observed on radar through the afternoon hours. In the late afternoon, the overcast skies cleared and cumulus clouds started forming over the area. Isolated convective rain showers fell over the protected area through the early nighttime hours.<br><br>Max cell top: 7.6km, 65.3 max dBz, 35.8 max VIL<br><br>Tmax YC = 18.3C and 1.9mm of rain.<br>Tmax QF = 19.2C and 3.2mm of rain.<br>Tmax Radar = 18.8C and 20.8mm of rain. | HS1 was launched at 1204Z to a storm developing west of Calgary. The flight was airborne at 1215Z. They started patrolling over Calgary at 1220Z. At 1305Z, HS1 began patrolling over the town of Beiseker. Then at 1329Z, the thunderstorms were no longer a threat, so the aircraft RTB. They landed at 1345Z.<br><br>Flight Summary<br>HS1: 1207Z-1349Z; no seeding; patrol Calgary, patrol Beiseker. |
| June 26, Thursday | A relative weak southwesterly jet was in place over southern AB. The area was expected to see southwesterly flow for most of the forecast period. A few waves of positive vorticity advection moved northeastward across the region during the day and night. Surface winds were mainly out of the south at 5 to 10 kts. The troposphere stayed moderately unstable through the daytime hours. The 0 to 6 km bulk shear was roughly around 25 kts.<br><br>A couple TITAN cells formed southeast of the Strathmore area during the morning and tracked northeastward. In the early afternoon, scattered convective cells formed over parts of the project area. The convection was strongest near the Sundre and Three Hills areas. In the late afternoon, a cluster of storms formed near the Sundre area and propagated eastward towards the Olds-Didsbury area. Two storms (#1 and #2) also formed east of Rocky MH during the early evening hours. These two storms tracked westward through the Rock MH area. Radar data indicated that grape size hail may have fallen to the east of Rocky MH. Isolated convective rain showers fell over the region through the early nighttime hours.<br><br>Pea size hail was reported northwest of Sundre.<br><br>Max cell top: 9.1km, 62.6 max dBz, 40.5 max VIL<br><br>Tmax YC = 20.5C and no rain. | HS5 was launched for patrol at 2306Z. The aircraft was airborne at 2328Z. They then started patrolling the Rocky MH area starting at 2356Z. At 0024Z (06/27) HS5 started seeding storm #1 which was tracking northwestward towards Rocky MH. Storm #1 then weakened and was no longer a threat to Rocky MH, so the flight repositioned a short distance to a new intensifying storm (#2) east of Rocky MH and started seeding this storm at 0037Z (06/27). Then at 0120Z (06/27) the crew reported that the thunderstorm was dissipating, so they stopped seeding and RTB. The flight landed at 0146Z (06/27).<br><br>Flight Summary<br>HS5: 2314Z (06/26)-0149Z (06/27); 113 EJ, 4 BIP; #1 Rocky MH, #2 Rocky MH. |

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| | Tmax QF = 21.2C and 1.6mm of rain.<br>Tmax Radar = 19.4C and 6.3mm of rain. | |
| June 27, Friday | Jet energy remained well to the east and southeast of the area. Diffluence at the upper levels aided in enhancing rising motions in the troposphere. A midlevel trough extended from the closed low off the coast of BC down to Texas. Positive vorticity advection was expected to be strongest in the evening. Lee cyclogenesis occurred west of Edmonton and a lee trough extended southeastward from the low through central AB. The atmosphere was expected to stay moderately capped through the early afternoon. Area modified model soundings showed CAPE values of around 800 J/kg with around 20 kts of effective bulk shear.<br><br>Towering cumulus clouds began developing over the foothills in the late morning. These clouds intensified into thunderstorms and moved into the western project area in the early afternoon. The first storm (#1) of the afternoon formed west of the town of Cremona. A longer lived and more organized storm next formed west of Sundre. This storm (#2) slowly tracked eastward through the town of Sundre. Radar data indicated that walnut size hail may have fallen northwest of Sundre. Then at roughly 2130Z another organized storm (#3) grew west of Calgary and tracked eastward towards the Calgary area. This thunderstorm dissipated before reaching the city limits of Calgary. Another line of thunderstorms (storm #4) intensified over the Cremona area and tracked eastward towards the city of Airdrie. This storm produced a brief tornado which was observed by project pilots and reported to Environment Canada. The next storm (#5) started forming directly over Calgary at roughly 00Z and merged with the storm to the north (storm #4) as it tracked eastward. The last tall storm (#6) of the day formed southwest of Calgary and track northeastward across the city. Scattered thunderstorms continued forming over the project area through the overnight hours.<br><br>Pea size hail was reported in downtown Calgary.<br>Tornado 16 km south of Cremona, no damage reported.<br><br>Max cell top: 12.9km, 66.0 max dBz, 90.6 max VIL<br><br>Tmax YC = 23.1C and 2.2mm of rain.<br>Tmax QF = 21.4C and no rain.<br>Tmax Radar = 20.0C and no rain. | HS1 was launched to the southwest of Calgary at 1937Z. The flight became airborne at 1955Z and started patrolling west of Calgary at 2005Z. HS1 was then redirected to the Cremona area at 2008Z. At 2021Z, the crew started seeding storm #1 for the town of Cremona. The thunderstorm started dissipating, so at 2028Z they stopped seeding and repositioned to new convective growth near Turner Valley. At 2045Z HS1 started patrolling Turner Valley. HS1 then stopped patrolling and repositioned to stronger convection near the town of Cochrane at 2105Z. At 2111Z HS1 began patrolling Cochrane. HS1 was then redirected to the Cremona area at 2115Z. Then at 2126Z they started patrolling for the town of Carstairs. The aircraft then repositioned to new visual development north of Cochrane at 2132Z. At 2136Z HS1 started patrolling north of Cochrane. They were then redirected to Sundre at 2225Z. Before reaching Sundre HS1 was repositioned back to the Calgary area at 2226Z. They started seeding storm #3 at 2237Z for Calgary. The aircraft extended their line further to the northeast, closer to Airdrie, at 2255Z. At 2307Z HS1 started seeding storm #4 for Airdrie. They then stopped seeding and RTB at 2356Z. The aircraft landed at 0006Z (06/28).<br><br>HS3 was launched at 2038Z to an organized storm NW of Sundre. The aircraft became airborne at 2053Z. Upon arriving at the thunderstorm, HS3 started top seeding storm #2 for the town of Sundre at 2107Z. The crew continued seeding the storm as it slowly crept towards the town of Sundre. HS3 stopped seeding at 2227Z and expedited to a new storm west of Airdrie. The crew descended to base seeding altitude while enroute to the convection. They started base seeding storm #4 west of Airdrie at 2242Z. They then stopped seeding and RTB at 2314Z. The aircraft landed at 2332Z.<br><br>HS4 was launched to storm NW of Sundre at 2059Z. The flight became airborne out of YQF at 2119Z and began flying to the Sundre storm. Then at 2136Z they started seeding #2 for Sundre. At 2213Z the thunderstorm was no longer a threat to the town of Sundre, so HS4 stopped seeding and RTB. The aircraft landed in EA3 at 2226Z.<br><br>HS2 was launched at 2117Z to convection over the foothills west of Calgary. HS2 was airborne at 2136Z, and they started patrolling west of |

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| | | YBW at 2139Z. They repositioned to a different TITAN cell to the SW of Calgary at 2153Z. Then at 2157Z the aircraft started patrolling for Calgary. HS2 started seeding storm #3 at 2226Z for Calgary. At 2314Z HS2 not finding any inflow, so they stopped seeding and started patrolling. HS2 stopped patrolling and RTB at 2322Z. The aircraft landed at 2331Z.<br><br>HS5 was launched at 2230Z to a rapidly intensifying cluster of TITANs cells to the southwest of Calgary. The flight became airborne at 2250Z and began climbing up to top seeding altitude. They then started patrolling the Okotoks area starting at 2304Z. At 2339Z HS5 was repositioned to the west of Airdrie in order to take over for HS1. HS5 then started seeding storm #4 at 2348Z for the city of Airdrie. At 2355Z the aircraft repositioned further south and started seeding storm #5 for Calgary. They then stopped seeding and repositioned at 0045Z (06/28) to southwest of Calgary. The aircraft began patrolling southwest of Calgary at 0050Z (06/28). At 0104Z (06/28) HS5 stopped patrolling and RTB. They landed at 0114Z (06/28).<br><br>HS4 was launched at 2310Z to a line of thunderstorms west of Airdrie. The aircraft was airborne out of EA3 at 2318Z. At 2330Z HS4 started seeding storm #4 for Airdrie. They repositioned further south at 0002Z (06/28). Then at 0005Z (06/28) HS4 started seeding storm #5 for Calgary. New growth then started to form over northwestern Calgary, so HS4 was redirected to this area of Calgary at 0043Z (06/28). HS4 stopped seeding and RTB at 0047Z (06/28). The aircraft landed in YQF at 0116Z (06/28).<br><br>HS1 was launched at 0123Z (06/28) to a rapidly intensifying storm southwest of Calgary. The flight was airborne at 0137Z (06/28) and started climbing to top seeding altitude as they flew towards the southern side of the storm. At 0154Z (06/28) HS1 started seeding storm #6 for Calgary. The crew continued seeding the storm as it moved over Calgary. Then at 0325Z (06/28) the storm was gradually weakening, so they stopped seeding and started patrolling the same area. HS1 RTB at 0330Z (06/28) and landed at 0340Z (06/28).<br><br>HS2 was launched to vigorous growth to the south of Cochrane at 0123Z (06/28). The aircraft became airborne at 0142Z (06/28). Then at 0153Z (06/28) they started seeding along the southern side of storm #6 for Calgary. At 0213Z (06/28) they stopped seeding and started patrolling the same area. HS2 then |

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| | | stopped patrolling and RTB at 0237Z (06/28). They landed at 0241Z (06/28).<br><br>Flight Summary<br>HS1: 1946Z (06/27)-0008Z (06/28); 72 EJ, 15 BIP; #1 Cremona, patrol Turner Valley, patrol Cochrane; patrol Carstairs, #3 Calgary, #4 Airdrie.<br>HS3: 2045Z-2337Z; 252 EJ, 22 BIP; #2 Sundre, #4 Airdrie.<br>HS4: 2109Z-2228Z; 74 minutes wing-tip generators, 4 BIP; #2 Sundre; takeoff YQF, land EA3.<br>HS2: 2123Z-2333Z; 98 minutes wing-tip generators, 2 BIP; patrol west of YBW, #3 Calgary.<br>HS5: 2238Z (06/27)-0118Z (06/28); 110 EJ, 7 BIP; patrol Okotoks, #4 Airdrie, #5 Calgary, patrol SW of Calgary.<br>HS4: 2313Z (06/27)-0118Z (06/28); 154 minutes wing-tip generators, 9 BIP; #4 Airdrie, #5 Calgary; takeoff EA3, land YQF.<br>HS1: 0128Z (06/28)-0344Z (06/28); 114 EJ, 13 BIP; #6 Calgary.<br>HS2: 0132Z (06/28)-0244Z (06/28); 40 minutes wing-tip generators, 2 BIP; #6 Calgary. |
| June 28, Saturday | The main core of the upper level jet remained well south of the region. The midlevel flow over central AB continued to be light and variable. 500mb temperatures cooled by roughly 1C during the daytime hours which helped to destabilize the troposphere. Vorticity advection was expected to be strongest during the afternoon hours. Surface winds were mainly out of the northwest. The atmosphere stayed moderately unstable through sunset. Speed shear values were only around 20 kts.<br><br>Several weak thunderstorms developed over the northeastern quadrant of the protected region in the early morning. The convective activity then moved to the northeast in the late morning. In the afternoon, thunderstorms formed along the foothills west of Calgary and Okotoks. This convection slowly dissipated after pushing into the southern project area. Storm #1 formed southwest of Calgary and moved towards the city of Okotoks before dissipating. Another storm (#2) developed northwest of Cochrane in the evening. This storm tracked through the city of Cochrane and quickly diminished as it moved into western Calgary. Isolated convective rain showers and weak thunderstorms then occurred in the late evening and overnight.<br><br>Max cell top: 12.1km, 64.7 max dBz, 60.1 max VIL<br><br>Tmax YC = 20.2C and 0.4mm of rain.<br>Tmax QF = 17.8C and 1.4mm of rain.<br>Tmax Radar = 18.6C and 0.3mm of rain. | HS5 was launched at 2019Z to a TITAN cell south of YBW heading towards Okotoks. The flight was airborne at 2038Z. They started patrolling for the Okotoks area starting at 2045Z. HS5 started seeding storm #1 at 2100Z for Okotoks. At 2110Z they stopped seeding and repositioned to new convective development over the YBW area. HS5 started patrolling the YBW area at 2119Z. At 2123Z all of convection inside the project area was diminishing, so they RTB. The aircraft landed at 2136Z.<br><br>HS1 was launched at 0219Z (06/29) to a thunderstorm NW of Calgary. The aircraft became airborne at 0232Z (06/29) and began climbing to the top seeding altitude. At 0238Z (06/29) they started seeding storm #2 for the Cochrane area. Then at 0313Z (06/29) HS1 was not find any new growth, so the crew stopped seeding and started patrolling Calgary. At 0319Z (06/29) HS1 stopped patrolling and RTB. They landed at 0329Z (06/29).<br><br>HS2 was launched at 0238Z (06/29) to a growing convective cell northwest of Cochrane. They were airborne at 0253Z (06/29). HS2 quickly found inflow and began seeding storm #2 for Cochrane at 0257Z (06/29). At 0313Z (06/29) the thunderstorm was continuing to diminish, so they stopped seeding and RTB. The aircraft landed at 0317Z (06/29). |

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| | | Flight Summary<br>HS5: 2026Z-2140Z; 6 EJ; #1 Okotoks, patrol YBW.<br>HS1: 0226Z (06/29)-0332Z (06/29); 24 EJ, 5 BIP; #2 Cochrane, patrol Calgary.<br>HS2: 0246Z (06/29)-0320Z (06/29); 30 minutes wing-tip generators; #2 Cochrane. |
| June 29, Sunday | Upper level jet energy was not affecting the project area. A modest pulse of vorticity was expected to advect from N to S through the day. Clouds would remain across the entire project area through the day and night. Rain showers were expected to favor the northern half of the project area, though light rain was anticipated throughout the project area. Embedded thundershowers were anticipated, but limited instability would not allow significant hail threats.<br><br>Thunderstorms developed in the southwest region of the project buffer zone around 21Z and briefly became a marginal hail threat before moving south of the buffer. All max radar values were from this weak isolated convection. Rain showers moved southward across the project area over the course of the day and night, exiting the southern project boundary around midnight. A few minor shallow convective cells developed between 7-12Z. Lightning did occur in the project area. Radar indicated grape size hail may have fallen southwest of High River.<br><br>Max cell top: 9.1 km, 61.7 max dBz, 43.8 max VIL<br><br>Tmax YC = 15.9C and 3.6mm of rain.<br>Tmax QF = 13.7C and 8.2mm of rain.<br>Tmax Radar = 14.7C and 3.3 mm of rain. | No aircraft operations. |
| June 30, Monday | The upper level jet would slowly propagate into the project area during the overnight hours. Modest PVA would accompany this transition, along with a pulse of mid-level PVA in the early morning hours. Daytime instability was limited.<br><br>Morning showers left the project area by 1530Z. Dry conditions then held until 00Z, when weak thunderstorms developed in the southwest project area. One cell briefly became a small hail threat southwest of Cochrane. All convection weakened and moved out of the area by 0730Z. A few light rain showers occurred overnight. Lightning did occur in the project area. Radar indicated pea size hail may have occurred south of Cochrane.<br><br>Max cell top: 7.6 km, 56.2 max dBz, 20.4 max VIL<br><br>Tmax YC = 21.7 C and 1.4mm of rain.<br>Tmax QF = 20.6 C and a trace of rain.<br>Tmax Radar = 20.5 C and 0.3mm of rain. | No aircraft operations. |
| July 1, Tuesday | A strong upper level ridge was moving into the region throughout the day. Sinking air associated with the ridge would produce a significant cap, preventing significant convection from developing in the project area. No | No aircraft operations. |

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| | significant forcing mechanisms were expected through the forecast period.<br><br>Conditions remained dry throughout the day and night. Skies were mostly clear throughout the project area, and no distinguishable radar returns were observed.<br><br>No TITAN cells.<br><br>Tmax YC = 23.9 C and no rain.<br>Tmax QF = 23.4 C and no rain.<br>Tmax Radar = 22.4 C and no rain. | |
| July 2, Wednesday | The axis of an upper level ridge was moving east away from the project area. A significant cap associated with the ridge would erode through the forecast period. A lobe of midlevel vorticity would pass through the region during the overnight hours, which was expected to break the cap and allow elevated convection with small hail to develop.<br><br>No significant convective development happened throughout the period. A light rain shower did occur in the northwest project area overnight, but it was not strong enough to be identified as a TITAN cell on the radar. There was no lightning in the project area.<br><br>No TITAN cells.<br><br>Tmax YC = 25.5C and no rain.<br>Tmax QF = 25.4C and no rain.<br>Tmax Radar = 24.6C and no rain. | No aircraft operations. |
| July 3, Thursday | An upper level jet streak was northwest of the project area. An area of mid-level vorticity responsible for an area of rain and convection in extreme S. Alberta Thursday morning moved northeast toward the southeast project area. Outflow from this decaying activity, combined with the vorticity advection, was expected to serve as a catalyst for new thunderstorm development in the afternoon. A cold front was also expected to pass through the project area overnight, providing another forcing for activity late in the evening. All convection was expected to be significant hail threats, with very high CAPE and tops reaching the tropopause.<br><br>Rain from southern Alberta moved through the southeastern region of the project area between 1730Z and 2000Z. Hailstorms initiated in the northwest quadrant of the project area which threatened the Rocky Mountain House area. Convection continued to push east through Sylvan and Red Deer. Radar indicated this line of thunderstorms may have produced up to grape sized hail in Sylvan and Red Deer. Radar also indicated golf ball size hail may have fallen north of Rocky Mountain House. There was lightning in the project area.<br><br>Max cell top: 15.1km, 67.9 max dBz, 145.5 max VIL<br><br>Tmax YC = 29.1C and no rain.<br>Tmax QF = 28.7C and no rain. | After consulting with ARC, the radar pulse repetition frequency was changed from 800 to 600 Hz which greatly reduced the appearance of second trip echoes.<br><br>HS1 was launched at 1929Z for patrol. They were airborne at 1944Z and began patrolling Cochrane at 1952Z. At 2134Z HS1 RTB, and landed at 2144Z.<br><br>HS4 was launched at 1931Z to Rocky Mountain House. They were airborne at 1955Z. At 2015Z HS4 briefly patrolled Rocky Mountain House. Finding no hail threats in the area, they landed at CYRM at 2025Z.<br><br>HS4 was launched from Rocky Mountain House at 2040Z. They were airborne at 2051Z. They began patrol for Rocky Mountain House at 2058Z. Convection in the area then weakened. At 2130Z, HS4 returned to Rocky Mountain House airport, landing at 2139Z.<br><br>HS4 was launched again from Rocky Mountain House at 2346Z. They were airborne at 2350Z. They proceeded west to a developing storm and began base seeding storm #1 for Rocky MH at 0004Z (07/04). HS4 stopped seeding at |

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| | Tmax Radar = 28.2C and no rain. | 0102Z (07/04) and continued patrolling the same storm. HS4 resumed seeding storm #1 at 0124Z (07/04) as the storm approached Eckville, and continued seeding until the cell moved through Red Deer. They ceased seeding and RTB at 0253Z (07/04). HS4 landed in Red Deer at 0302Z (07/04).<br><br>HS2 was launched at 0114Z (07/04). They were airborne at 0129Z (07/04) and proceeded to the cluster of thunderstorms west of Red Deer. HS2 began base seeding at 0155Z (07/04) for storm #1 Sylvan and stayed with the storm until it moved through Red Deer. At 0250Z (07/04), HS2 stopped seeding and repositioned to new cells near Linden. They began patrolling Linden at 0313Z (07/04). At 0318Z (07/04), there were no threats remaining, and HS2 RTB to YBW. They landed at 0337Z (07/04).<br><br>HS3 was launched at 0131Z (07/04). They were airborne at 0148Z (07/04) and proceeded to the thunderstorms west of Red Deer. HS3 began top seeding at 0200Z #1 Sylvan. After the storm passed through Red Deer, they stopped seeding and RTB at 0254Z (07/04). HS3 landed at 0304Z (07/04).<br><br>Flight Summary<br>HS1: 1936Z-2148Z; no seeding; patrol Calgary.<br>HS4: 1945Z-2031Z; no seeding; patrol Rocky Mountain House; takeoff CYQF, land CYRM.<br>HS4: 2045Z-2145Z; no seeding; patrol Rocky Mountain House; takeoff CYRM, land CYRM.<br>HS4: 2340Z-0310Z (07/04); 294 minutes wing-tip generators, 15 BIP; #1 Rocky Mountain House to Red Deer.<br>HS2: 0120Z (07/04)-0339Z (07/04); 112 minutes wing-tip generators, 12 BIP; #1 Sylvan to Red Deer, patrol Linden.<br>HS3: 0137Z (07/04)-0308Z (07/04); 170 EJ, 8 BIP; #1 Sylvan to Red Deer. |
| July 4, Friday | There was an upper level jet streak moving toward the project area throughout the period. Upper level divergence in the left exit region of this jet was deepening a lee cyclone near Calgary as it shifted east across the project area overnight. A modest area of mid-level vorticity was also expected to advect through overnight. The combination of the forcing mechanisms was expected to produce rain showers across the area overnight. Instability was poor, preventing any significant thunderstorm development.<br><br>A Chinook Arch overspread much of the project area throughout the day. At 22Z, a small thunderstorm developed over the foothills west of Sundre which slowly advanced eastward into the project area. It briefly pulsed to a marginal hail threat around 2315Z before dissipating | A radar tour occurred at the Olds-Didsbury airport with 11 people from insurance companies in attendance. Ten of the scheduled attendees were absent. They were called away to assist with flood claims in Manitoba.<br><br>HS2 flew a PR flight. The aircraft was airborne out of YBW at 1655Z and landed in EA3 at 1717Z.<br><br>After the radar tour, HS2 took off from EA3 and was enroute to YBW when the aircraft was diverted to quickly developing convection west of Sundre. The flight became airborne out of EA3 at 2300Z. At 2318Z they started patrolling |

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| | around 00Z (07/05). A few convective rain showers developed near Rocky Mountain House in the late evening, but they did not reach hail criteria. A broad area of light rain and virga moved through the project area overnight, but it did not produce measurable precipitation at the radar nor the Calgary or Red Deer airports. There was lightning in the project area. Radar indicated pea size hail may have fallen northeast of Rocky Mountain House.<br><br>Max cell top: 8.1km, 58.6 max dBz, 22.1 max VIL<br><br>Tmax YC = 25.3 C and no rain.<br>Tmax QF = 24.0 C and no rain.<br>Tmax Radar = 22.9 C and no rain. | for the town of Sundre. Then at 2337Z, the convective TITAN cell was no longer a threat to the town of Sundre, so the crew RTB. No seeding occurred. The aircraft landed in YBW at 2357Z.<br><br>Flight Summary<br>HS2: 1642Z-1719Z; no seeding; PR flight; takeoff YBW, land EA3.<br>HS2: 2252Z (07/04)-0000Z (07/05); no seeding; patrol Sundre; takeoff EA3, land YBW. |
| July 5, Saturday | An upper level jet streak was moving across the northern project area. Mid-level vorticity advection was neutral to negative. A lee trough was expected to develop through the afternoon, assisting upslope convection in the foothills. Moderately strong mid and upper level winds would push these storms into the western project area.<br><br>Convection initiated west of Caroline at 2245Z which passed through Bowden. The storm intensified quickly and made a right turn, indicative of organization and rotation. Additional thunderstorms developed in the northern buffer zone around 0100Z (07/06) and generally tracked ESE through Lacombe. Convection continued in the northern third of the project area and buffer through 0700Z (07/06), when conditions stabilized across the project area. There was lightning in the project area.<br><br>Dime size hail in central Lacombe (phone report). Radar indicated golf ball size hail may have fallen immediately northeast of Rimbey in the buffer zone.<br><br>Max cell top: 11.4 km, 72.0 max dBz, 166.0 max VIL<br><br>Tmax YC = 23.7 C and a trace of rain.<br>Tmax QF = 22.4 C and no rain.<br>Tmax Radar = 21.8 C and no rain. | HS5 was launched at 2311Z for a developing storm near Caroline. They were airborne at 2329Z and began top seeding storm #1 Bowden at 2352Z. HS5 stopped seeding at 0110Z (07/06) as the storm moved east of QE2, and RTB. HS5 landed at 0128Z (07/06).<br><br>HS4 was launched at 2319Z for the same developing storm near Caroline. They were airborne at 2337Z and started base seeding at 2350Z #1 Bowden. HS4 stopped seeding at 0110Z (07/06) as the storm moved east of the QE2 and RTB. They landed at 0123Z (07/06).<br><br>HS2 was launched at 0127Z (07/06) for convective growth near Rimbey. They were airborne at 0146Z (07/06). HS2 began base seeding #2 Lacombe at 0222Z (07/06). After the cell passed Lacombe, they ceased seeding and RTB at 0308Z (07/06). They landed at 0343Z (07/06).<br><br>HS3 was launched at 0140Z (07/06) for the convective growth near Rimbey. They were airborne at 0159Z (07/06). HS3 arrived at the cell and began top seeding at 0212Z (07/06) #2 Lacombe. At 0308Z (07/06) the storm crossed the QE2, so HS3 stopped seeding and RTB. They landed at 0314Z (07/06).<br><br>HS1 was launched at 0144Z (07/06) for convective development northwest of Rocky Mountain House. They were airborne at 0201Z (07/06) and began to patrol the northern buffer at 0235Z (07/06). At 0257Z (07/06) it was evident the convection they monitored was no longer a threat to the project area, and HS1 RTB. They landed at 0330Z (07/06).<br><br>Flight Summary<br>HS5: 2316Z (07/05)-0130Z (07/06); 181 EJ, 10 BIP; #1 Bowden.<br>HS4: 2327Z (07/05)-0127Z (07/06); 160 minutes of wing-tip generators, 11 BIP; #1 |

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| | | Bowden.<br>HS2: 0135Z (07/06)-0345Z (07/06); 92 minutes of wing-tip generators, 9 BIP; #2 Lacombe.<br>HS3: 0150Z (07/06)-0321Z (07/06); 233 EJ, 4 BIP; #2 Lacombe.<br>HS1: 0152Z (07/06)-0331Z (07/06); no seeding; patrol northern buffer. |
| July 06, Sunday | An upper level jet streak was over southern AB for most of the forecast period, although jet PVA was expected to be strongest during the afternoon and evening. A shortwave trough pushed into the area during peak heating. 500mb temperatures cooled by around 1C during the daytime hours. Surface winds were out of the north to northwest. Area modified model soundings indicated that long-lived moderately strong thunderstorms were a possibility.<br><br>Scattered convective rain showers fell over the southern project area during the morning hours. In the afternoon, towering cumulus clouds developed along the foothills. The first organized cluster of TITAN cells pushed into the project area in the midafternoon. This storm (#1) became more organized and moved southeastward across Calgary. After moving through Calgary, this storm continued to push southeastward across the protected area. Radar data indicated that golf ball sized hail may have fallen to the southwest of Strathmore. Another storm (#2) then developed behind the first storm and moved southeastward towards northern Calgary. This storm slowly weakened before moving over the northeastern part of Calgary. The next storm (#3) grew over the foothills to the northwest of Sundre and tracked southeastward through the town of Didsbury. Another storm (#4) initiated west of Crossfield and moved southeastward through Airdrie and towards the town of Strathmore. The last significant thunderstorm (storm #5) of the day formed just to the west of Cochrane and tracked towards the Calgary area. Convective rain showers persisted over the southern half of the project area through the rest of the evening and nighttime hours.<br><br>Up to 1.5 cm size hail was reported in downtown Calgary. Up to 1 cm size hail was measured at the Olds-Didsbury airport radar site. Quarter size hail was reported in Didsbury. Pea size hail was reported near Crossfield. Toonie size hail was reported in Langdon (west-southwest of Strathmore).<br><br>Max cell top: 12.1km, 68.6 max dBz, 119.5 max VIL<br><br>Tmax YC = 24.3C and 6.6mm of rain.<br>Tmax QF = 22.5C and no rain.<br>Tmax Radar = 22.7C and 4.3mm of rain. | HS1 was launched to an intensifying convective storm northwest of Cochrane at 2147Z. The aircraft became airborne at 2203Z. Upon arriving at the storm (#1), they started top seeding for Calgary at 2217Z. The crew continued seeding the storm as it moved into Calgary from the northwest. At 2350Z, HS1 continued seeding as they descended to the base seeding altitude. At 2359Z, they stopped seeding and repositioned to a new cell north of Cochrane. HS1 started base seeding storm #2 for Calgary with BIP flares at 0005Z (07/07). The storm was then diminishing at 0048Z (07/07), so the crew stopped seeding and RTB. They landed at 0056Z (07/07).<br><br>HS2 was launched at 2203Z to a cluster of TITAN cells north of Cochrane. At 2217Z, the flight became airborne. They began finding consistent inflow at 2230Z, so HS2 started base seeding storm #1 for Calgary. HS2 continued seeding as the storm moved southeastward across the city. At 2333Z, HS2 stopped seeding and RTB. The aircraft landed at 2339Z.<br><br>HS5 was launched to storm #1 at 2316Z in order to replace HS1 for top seeding. The aircraft was airborne at 2335Z and began climbing to the top seeding altitude. Then at 2349Z, the aircraft replaced HS1 and started top seeding storm #1. HS5 then stopped seeding and was redirected to an intensifying storm northwest of Calgary at 0007Z (07/07). At 0010Z (07/07) they started seeding storm #2 for Calgary. HS5 then stopped seeding and RTB at 0059Z (07/07). They landed at 0111Z (07/07).<br><br>HS4 was launched at 2346Z to a long-lived storm northwest of Sundre. The flight became airborne at 0001Z (07/07) and started flying towards the Sundre area. HS4 was then repositioned to storm #2 northwest of Calgary at 0014Z (07/07). The crew started base seeding storm #2 for Calgary at 0031Z (07/07). They then stopped seeding and repositioned to northwest of Didsbury at 0053Z (07/07). HS4 then started seeding storm #3 for Didsbury at 0113Z (07/07). At 0129Z (07/07) the storm was no longer a threat to any population centers, so they stopped seeding and RTB. The aircraft |

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| | | landed at 0150Z (07/07).<br><br>HS3 was launched at 0020Z (07/07) to a tall and long-lived storm northwest of Calgary. They were airborne at 0038Z (07/07) and started climbing to the top seeding altitude. At 0053Z (07/07) HS3 started top seeding storm #3 for Didsbury. At 0131Z (07/07), they stopped seeding and started patrolling the Cremona area. HS3 then started finding decent growth northwest of Airdrie, so they started seeding storm #4 at 0207Z (07/07). They stopped seeding at 0220Z (07/07) and dropped to the base seeding altitude as they were repositioning to the northwest of the Strathmore area. HS3 started base seeding storm #4 again for the town of Strathmore at 0228Z (07/07). At 0302Z (07/07), they stopped seeding and RTB. The flight landed at 0355Z (07/07).<br><br>HS1 was launched to a long-lived storm moving towards the Strathmore area at 0209Z (07/07). The flight was airborne at 0217Z (07/07) and climbed to top seeding altitude while enroute to the Strathmore storm. HS1 then started seeding storm #4 for Strathmore at 0240Z (07/07). At 0310Z (07/07), they stopped seeding and were directed to RTB. En route toward YBW, new convection started forming near Cochrane, so the flight was repositioned to this area and RTB cancelled. They began patrol of Cochrane at 0322Z (07/07). Then at 0335Z (07/07), HS1 started seeding storm #5 for Calgary. At 0400Z (07/07) the crew stopped seeding and resumed patrolling Cochrane. HS1 then stopped patrolling and RTB at 0404Z (07/07). They landed at 0414Z (07/07).<br><br>Flight Summary<br>HS1: 2154Z (07/06)-0104Z (07/07); 303 EJ, 18 BIP; #1 Calgary, #2 Calgary.<br>HS2: 2210Z-2341Z; 126 minutes wing-tip generators, 12 BIP; #1 Calgary.<br>HS5: 2323Z (07/06)-0125Z (07/07); 225 EJ, 5 BIP; #1 Calgary, #2 Calgary.<br>HS4: 2356Z (07/06)-0156Z (07/07); 76 minutes wing-tip generators, 4 BIP; #2 Calgary, #3 Didsbury.<br>HS3: 0029Z (07/07)-0401Z (07/07); 291 EJ, 16 BIP; #3 Didsbury, patrol Cremona, #4 Airdrie to Strathmore.<br>HS1: 0213Z (07/07)-0420Z (07/07); 144 EJ, 14 BIP; #4 Strathmore, #5 Calgary. |
| July 07, Monday | The northwesterly upper level jet streak over southern AB was expected to slide southeastward out of the area during the afternoon. A mid and upper level ridge gradually built over the area from the west. Ridging was expected throughout the forecast period. The surface | No aircraft operations. |

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| | wind flow was out of the northwest. Surface high pressure stayed centered over central AB through the early evening. Area thermodynamic model soundings showed a slightly unstable atmosphere with moderately strong speed shear.<br><br>Weak echoes were observed on radar during the early morning hours. Cumulus clouds then formed over parts of the protected area in the afternoon. The region saw mostly clear skies in the evening and overnight. No TITAN cells were observed on radar throughout the forecast period.<br><br>30.4 max dBz<br><br>Tmax YC = 23.1C and 2.4mm of rain.<br>Tmax QF = 23.0C and no rain.<br>Tmax Radar = 22.8C and no rain. | |
| July 08, Tuesday | Upper level jet energy stayed north of the region. The mid and upper level ridge continued to build over southern AB through the afternoon. The ridge was expected to shift east of the area in the evening as a trough moved into northern British Columbia. 500mb temperatures warmed by roughly 1C during the daytime. A 700mb thermal ridge stayed in place through the evening. Surface high pressure was centered along the AB/SK border during the day but was expected to move eastward. Modified model soundings for the region suggested that the atmosphere would be moderately capped with 800 to 900 J/kg of CAPE.<br><br>Mostly clear skies were observed over the northern project area through the morning and afternoon. The southern half of the protected area saw towering cumulus clouds along the western boundary during the afternoon. Altocumulus and altostratus were also observed over the parts of the region. Overnight, very weak echoes were seen on radar near Airdrie. No TITAN cells were observed.<br><br>24.8 max dBz<br><br>Tmax YC = 25.6C and no rain.<br>Tmax QF = 25.9C and no rain.<br>Tmax Radar = 24.3C and no rain. | No aircraft operations. |
| July 09, Wednesday | An 85 knot jet core started to nose its way into central AB in the afternoon from the west. An intensifying closed low moved eastward into northern AB during the day and night. 500mb temperatures cooled by approximately 3C during the daytime hours. Moderately strong PVA was expected in the afternoon, but stronger PVA looked to be likely beginning in the early evening. Surface and low level moisture pooling was present over the area through the early nighttime hours. At the surface, a cold front slid south-southeastward across the area during late afternoon and evening. The 00Z YQF sounding showed that the atmosphere would be very unstable with around 60 kts of effective bulk shear. Soundings indicated that | HS2 was launched to the Rocky MH area at 2152Z. The aircraft was airborne at 2216Z. At 2242Z, HS2 started briefly patrolling the Caroline area. They were finding no significant convective growth so the crew started patrolling Rocky MH at 2250Z. At 2317Z, HS2 started base seeding storm #1 for Eckville. HS2 continued seeding this storm as it tracked eastward through Eckville, Bentley, Blackfalds, and northern Red Deer. HS2 then stopped seeding at 0100Z (07/10) and repositioned to west of Innisfail. They started seeding storm #3 for Innisfail at 0104Z (07/10). Then at |

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| | the tropopause would be near 40 kft MSL.<br><br>The western half of the project area saw shallow cumulus clouds in the late morning and early afternoon. Deep convection then started developing north of Rocky MH in the midafternoon as the cold front began to slide south-southeastward into the area. In the late afternoon, convection began growing inside the northwestern part of the area. At this same time, severe thunderstorms (storms #1 and #2) formed in the northern buffer zone. Storm #1 formed north of Rocky MH and tracked east-southeastward across the northern project area. Storm #2 tracked east-southeastward through Ponoka. Then at roughly 00Z a new push of explosive growth occurred along the southern edge of storm #1. This new push of growth was triggered by the cold front and eventually became part of the main storm. Storm #1 tracked through Eckville, Bentley, Lacombe, Blackfalds, and northern Red Deer. Radar data indicated that golf ball size hail may have fallen north of Eckville and near Blackfalds. Storm #3 then quickly developed west of Innisfail in the early evening. This storm tracked through Innisfail, Penhold, and Red Deer. During the late evening and overnight hours, the severe thunderstorm activity shifted to the east of the protected area. Nonetheless, weaker elevated thunderstorms tracked eastward across the far northern part of the area throughout the overnight hours.<br><br>Baseball size hail was reported near Leslieville (west of Eckville). Golf ball size hail was reported in Blackfalds. Grape size hail occurred in the Kentwood area of far northern Red Deer.<br><br>Max cell top: 14.4km, 67.8 max dBz, 202.5 max VIL<br><br>Tmax YC = 30.5C and no rain.<br>Tmax QF = 29.5C and 1.2mm of rain.<br>Tmax Radar = 28.8C and no rain. | 0158Z (07/10), the storm was no longer a threat, so they stopped seeding and RTB. The aircraft landed at 0223Z (07/10).<br><br>HS1 was launched at 2245Z to a cluster of long-lived and tall TITAN cells north of Rocky MH. The flight became airborne at 2304Z. Upon arriving at storm #1, they started top seeding at 2337Z for the town of Eckville. HS1 continued seeding the southern end of the storm as it moved eastward across the northern project area. Then at 0032Z (07/10), HS1 was running low on flares, so they stopped seeding and RTB as they were replaced by HS3. They landed at 0055Z (07/10).<br><br>HS4 was launched at 2250Z to a tall and long-lived thunderstorm northwest of Rimbey. The aircraft was airborne out of YQF at 2312Z. HS4 started base seeding storm #2 for Ponoka at 2319Z. The crew continued seeding the large powerful storm as it moved towards Ponoka and Lacombe. At 2340Z, HS4 continued seeding with wing-tip generators as they repositioned to storm #1 west of Eckville. At 2346Z, they started seeding storm #1 for Eckville. HS4 then stopped seeding at 0052Z (07/10) and started patrolling the Innisfail area. They stopped patrolling and RTB at 0106Z (07/10). Due to storms over YQF, the flight landed in EA3 at 0132Z (07/10).<br><br>HS3 was launched at 2328Z to a severe storm to the west of Eckville. The flight became airborne out of YQF at 2352Z and started climbing up to the top seeding altitude. HS3 then approached the severe hail storm HS1 was top seeding at 0009Z (07/10). They took over top seeding storm #1 0023Z (07/10) for Red Deer. HS3 continued seeding this long-lived and powerful storm as it moved towards Red Deer. Then at 0100Z (07/10), the crew stopped seeding and was redirected to a new storm with explosive growth west of Innisfail. HS3 then started top seeding storm #3 for Innisfail and Red Deer at 0102Z (07/10). The crew then stopped seeding and RTB at 0128Z (07/10). Due to storms over YQF, the aircraft landed in EA3 at 0134Z (07/10).<br><br>HS5 was launched at 0041Z (07/10) to a new line of convection west of Innisfail. The aircraft was airborne at 0104Z (07/10). At 0130Z (07/10), HS5 started top seeding storm #3 for Innisfail. The crew continued seeding the storm as it approached Innisfail, Penhold, and Red Deer. They then stopped seeding at 0206Z (07/10) and started flying back to YBW to RTB. En route to YBW, HS5 was redirected to a new thunderstorm heading towards Rocky |

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| | | MH at 0220Z (07/10). At 0237Z (07/10), they started patrolling for Rocky MH. At 0251Z (07/10) the thunderstorm was no longer tracking toward the Rocky MH area, so the aircraft stopped patrolling and RTB. They landed at 0322Z (07/10).<br><br>HS3 flew a reposition flight. They were airborne out of EA3 at 0213Z (07/10) and landed in YQF at 0226Z (07/10).<br><br>HS4 flew a reposition flight. They were airborne out of EA3 at 0329Z (07/10) and landed in YQF at 0345Z (07/10).<br><br>Flight Summary<br>HS2: 2207Z (07/09)-0225Z (07/10); 322 minutes wing-tip generators, 18 BIP; patrol Caroline, patrol Rocky MH, #1 Eckville, #3 Innisfail.<br>HS1: 2254Z (07/09)-0057Z (07/10); 268 EJ, 9 BIP; #1 Eckville.<br>HS4: 2258Z (07/09)-0136Z (07/10); 186 minutes wing-tip generators, 15 BIP; #2 Ponoka, #1 Eckville, patrol Innisfail; takeoff YQF, land EA3.<br>HS3: 2345Z (07/09)-0136Z (07/10); 296 EJ, 5 BIP; #1 Red Deer, #3 Innisfail; takeoff YQF, land EA3.<br>HS5: 0046Z (07/10)-0325Z (07/10); 145 EJ, 3 BIP; #3 Innisfail, patrol Rock MH.<br>HS3: 0207Z (07/10)-0230Z (07/10); no seeding; reposition flight; takeoff EA3, land YQF.<br>HS4: 0324Z (07/10)-0350Z (07/10); no seeding; reposition flight; takeoff EA3, land YQF. |
| July 10, Thursday | A westerly upper level jet streak was over central AB and SK. The right entrance region of the jet was expected to aid in enhancing rising motions over the region. At the mid-levels, a closed low was over northern AB. This low tracked eastward into northern SK in the afternoon. A shortwave trough moved counter-clockwise around the low. This low was expected to move across the region in the afternoon. Moderately strong PVA was possible through the afternoon. Surface winds were out of the NW to N. Area modified model soundings indicated that the atmosphere would be slightly unstable with moderate speed shear.<br><br>Isolated convective rain showers occurred over the northeastern part of the project area in the early morning. In the late afternoon, towering cumulus clouds quickly formed along the foothills west of Turner Valley. This convection developed into thunderstorms starting around 00Z. The thunderstorms tracked southeastward and weakened after they moved into the project area. Radar data suggested that grape size hail may have fallen in the southern buffer zone to the southwest of High River. The late evening and overnight hours saw diminishing cloud cover. | No aircraft operations. |

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| | Max cell top: 9.9km, 64.8 max dBz, 63.2 max VIL<br><br>Tmax YC = 22.5C and no rain.<br>Tmax QF = 21.1C and no rain.<br>Tmax Radar = 21.1C and no rain. | |
| July 11, Friday | A 70 knot upper level jet streak nosed its way into the area from the north during the afternoon and evening. A midlevel shortwave trough was located over southern BC and was expected to move southeastward towards Montana during the day. The shortwave trough negated the effects of the ridge building over western BC. Surface high pressure was centered over BC. Surface winds were out of the southeast, so weak upslope conditions were a possibility. Modified model soundings showed a moderately unstable air mass in place over the region with around 25 kts of effective bulk shear.<br><br>Smoke and haze were observed over the region through the evening hours. Only scattered cirrus and thin cumulus clouds were seen over area during the day and night. No echoes were observed on radar.<br><br>Tmax YC = 22.0C and no rain.<br>Tmax QF = 22.1C and no rain.<br>Tmax Radar = 20.7C and no rain. | No aircraft operations. |
| July 12, Saturday | Upper level jet energy was east of the area. A high amplitude ridge was building over AB throughout the forecast period. No PVA was expected. 500mb temperatures warmed by around 2C during the daytime hours. Surface high pressure was centered over the province. The 00Z modified model soundings showed anywhere from 100 to 400 J/kg of CAPE. These soundings also indicated that a strong cap would be present.<br><br>Mostly clear skies were seen over the region. No echoes were observed on radar.<br><br>Tmax YC = 27.8C and no rain.<br>Tmax QF = 27.4C and no rain.<br>Tmax Radar = 26.1C and no rain. | No aircraft operations. |
| July 13, Sunday | There were no upper-level jet influences expected. Mid-level vorticity advection looked to be insignificant, and there was weak low-level cool air advection coming from the east. A mid to upper-level ridge was predicted to reside over the project area through the forecast period. Mid-upper level air was forecast to remain fairly dry. Despite CAPE of over 1000 J/kg, a lack of forcing mechanisms, poor shear, and dry air aloft were expected to keep convection confined to the foothills and mountains.<br><br>Mostly clear skies prevailed across the project area with only isolated shallow afternoon cumulus. No meteorological echoes were seen on radar. | No aircraft operations. |

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| | Tmax YC = 28.7C and no rain.<br>Tmax QF = 28.4C and no rain.<br>Tmax Radar = 27.3C and no rain. | |
| July 14, Monday | A weak jet-level shortwave was anticipated to move across northern MT through the forecast period. A modest pulse of vorticity was expected to affect southern Alberta, and potentially the southern project area and buffer, overnight. A significant cap was forecast to hinder convection in the project area, and wind shear and storm motions were expected to be very weak.<br><br>A band of mid-upper level clouds spread across most of the project area through the afternoon-evening. No precipitation fell, and no radar echoes exceeded 30dbz. No lightning was observed, and there were no TITAN cells on radar.<br><br>Tmax YC = 26.1C and no rain.<br>Tmax QF = 26.2C and no rain.<br>Tmax Radar = 24.9C and no rain. | HS3 flew a PR flight to the radar. The aircraft was airborne from YQF at 1732Z and landed in EA3 at 1746Z.<br><br>HS3 flew a PR flight to return home after the radar tour. The aircraft was airborne from EA3 at 2205Z and landed in YQF at 2221Z.<br><br>A radar tour was conducted during the afternoon with 16 attendees from the insurance industry.<br><br>Flight Summary<br>HS3: 1726-1750Z; no seeding; PR flight; takeoff YQF, land EA3.<br>HS3: 2203-2226Z; no seeding; PR flight; takeoff EA3, land YQF. |
| July 15, Tuesday | Jet-level energy was expected to remain north and west of the project area. A weak pulse of mid-level vorticity was prognosticated to move through the project area between noon and midnight. However, it was not expected to be sufficient to break the modest cap. No other surface or low-level forcing mechanisms were anticipated, aside from a lee trough that would remain over the mountains and foothills.<br><br>Convection initiated deep in the mountains near the edge of the western project buffer, and remained there throughout the afternoon and evening. Haze and smoke spread over the project area, but minimal cumulus developed. Virga was reported at the Calgary airport at 13Z, but no significant radar echoes occurred. There were no TITAN cells or lightning in the project area.<br><br>Tmax YC = 27.6C and no rain.<br>Tmax QF = 26.9C and no rain.<br>Tmax Radar = 26.2C and no rain. | No aircraft operations. |
| July 16, Wednesday | A weakening jet streak was expected to pass through northern Alberta without affecting the project area. No significant mid-level vorticity advection was anticipated. A weakening cold front was draped across the project area, and was expected to drift SE and stall during the afternoon. Wind shear was expected to be weak, but instability was significant. Storms would initiate either in the vicinity of the front or along the foothills in the mid-late afternoon. Overnight, a developing lee cyclone would foster overnight convective rain showers, particularly in the southwest project area.<br><br>The project area remained capped throughout most of the afternoon with thick forest fire smoke overhead. High-based convection did initiate around 0015Z (07/17) south of Sundre, but remained relatively shallow and not a significant hail threat. At 2Z, more threatening convection | HS4 was launched at 0209Z (07/17) for developing convection between Olds and Sundre. They were airborne at 0227Z (07/17). HS4 reported that FU hindered effective visual base seeding, so they ascended for top seeding. They began top seeding at 0318Z (07/17) storm #1 Olds. At 0421Z (07/17) they stopped seeding storm #1 and repositioned to a new cell west of Innisfail. At 0424Z (07/17) HS4 patrolled west of Innisfail for a short time before RTB at 0426Z (07/17). They landed at 0445Z (07/17).<br><br>HS1 was launched at 0218Z (07/17). They were airborne at 0235Z (07/17) and proceeded to Turner Valley. At 0310Z (07/17) HS1 repositioned to the Cochrane area as the |

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| | developed just east of Sundre. By 3Z, convection initiated in many parts of the project area, but all convection remained relatively disorganized, obscured in smoke, and high-based. Loosely organized thunderstorms continued to pulse and develop across the project area from 4-9Z (07/17), when all activity moved east of the region. Radar indicated most storms only had a pea to grape sized hail threat, although one storm indicated walnut sized hail may have occurred southeast of Beiseker. Lightning did occur in the project area.<br><br>Max cell top: 14.4km, 64.3 max dBz, 83.8 max VIL<br><br>Tmax YC = 31.8C and no rain.<br>Tmax QF = 28.6C and a trace of rain.<br>Tmax Radar = 28.6C and 4.8mm of rain. | convection in Turner Valley dissipated. HS1 began patrolling Airdrie at 0400Z (07/17). They then started finding vigorous convective growth and began top seeding storm #2 for Didsbury at 4441Z (07/17). At 0528Z (07/17) the crew stopped seeding and RTB. They landed at 0549Z (07/17).<br><br>Flight Summary<br>HS4: 0218Z (07/17)-0451Z (07/17); 126 min wing-tip generators, 6 BIP, 90 EJ; #1 Olds, patrol Innisfail.<br>HS1: 0227Z (07/17)-0554Z (07/17); 271 EJ, 11 BIP; #2 Didsbury, patrol Turner Valley, patrol Cochrane, patrol Airdrie. |
| July 17, Thursday | An upper-level jet streak was expected to pass through the central project area between 0-9Z (07/18). Mid-level vorticity advection would support convection from early evening through midnight. A lee trough was expected to develop and intensify given the supporting upper-level jet streak. The trough would move across the project area throughout the day. Storm rotation, organized updrafts, and large hail were anticipated, given the wind shear profile. Conditions would stabilize after midnight.<br><br>Convection initiated shortly after briefing with a mature storm entering the project area west of Rocky Mountain House at 1828Z. This storm tracked through Bowden. Further south, another severe storm initiated west of Cremona at 1930Z which moved toward Balzac and Airdrie and creating very large hail. Weaker convective thundershowers continued after 0Z, and one cell near Calgary briefly pulsed to a (radar indicated) grape size hail threat but quickly weakened and moved out of the city. Rain showers gradually diminished in strength and coverage between 1-6Z (07/18), and the skies were clear by dawn.<br><br>Max cell top: 15.9km, 69.9 max dBz, 203.8 max VIL<br><br>Tennis ball size hail in Balzac.<br>Golf ball size hail in Airdrie.<br>Pea to grape size hail Olds.<br><br>Tmax YC = 26.2C and 1.5mm of rain.<br>Tmax QF = 23.8C and 23.4mm of rain.<br>Tmax Radar = 23.7C and 4.6mm of rain. | HS4 was launched at 1816Z for fast-moving, intense convection west of Rocky Mountain House. They were airborne at 1835Z. HS4 had difficulty finding an altitude with good visibility due to haze/smoke, but they were able to begin base seeding at 1917Z storm #1 Rocky Mountain House. At 2050Z, as the storm reached Bowden, HS4 stopped seeding and landed at Olds-Didsbury. After swapping out the ill copilot, HS4 immediately re-launched, and proceeded to new convection near Sundre. HS4 began seeding storm #4 Sundre at 2109Z. They continued seeding until the storm reached Olds. HS4 RTB at 2149Z. They landed in YQF at 2223Z.<br><br>HS5 was launched at 1847Z for new convection near Sundre. They were airborne at 1910Z. HS5 very briefly top seeded storm #2 Sundre at 1929Z. At 1930Z, they repositioned to the south for a more threatening cell. HS5 began seeding storm #3 Cremona at 1939Z. They began seeding with a heavy dose at 2106Z as the storm approached Airdrie. At 2128Z, HS5 stopped seeding and repositioned to a new storm near Springbank. They began patrolling Springbank at 2136Z. HS5 RTB at 2147Z. They landed in YBW at 2157Z.<br><br>HS3 was launched at 1917Z. They were airborne at 1934Z and proceeded to the Rocky Mountain House storm. HS3 began top seeding storm #1 Sylvan at 1950Z. At 2107Z, HS3 stopped seeding and repositioned to developing convection near Sundre. En route to Sundre, they descended to shed ice and then climbed back to top. HS3 began top seeding storm #4 Sundre at 2113Z and continued until it reached Olds. HS3 stopped seeding and RTB at 2147Z. They landed at YQF at 2159Z.<br><br>HS2 was launched at 2011Z. They were |

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| | | airborne at 2032Z and proceeded to the intensifying storm near Cremona. They began base seeding storm #3 Airdrie at 2040Z. At 2128Z HS2 repositioned to new development near Springbank, leaving generators on in transit. They began seeding storm #5 Calgary at 2141Z. At 2152Z, HS2 repositioned to additional new development west of Calgary, seeding in transit, and began seeding seed #6 Calgary at 2155Z. HS2 stopped seeding and repositioned to patrol Turner Valley at 2235Z. HS2 RTB at 2251Z. They landed in YBW at 2310Z.<br><br>HS1 was launched at 2034Z. They were airborne at 2054Z. After climbing south of Calgary and waiting to replace HS5 at cloud top, they repositioned toward the convection near Airdrie at 2124Z. They began top seeding storm #3 Airdrie at 2127Z. At 2136Z, HS1 repositioned to nearby development over Springbank and began seeding storm #5 Calgary. At 2158Z, HS1 repositioned further west for more new development west of Calgary. They began seeding this, storm #6 Calgary, at 2205Z. At 2226Z, HS1 stopped seeding and began to patrol Calgary. HS1 repositioned to more prominent convection near Turner Valley at 2235Z. They began seeding storm #7 Okotoks at 2244Z. HS1 stopped seeding and RTB Springbank at 2302Z. They landed at 2318Z.<br><br>HS5 was re-launched at 2344Z. They were airborne at 0005Z (07/18), and began patrolling Calgary at 0015Z (07/18). No seeding occurred. HS5 RTB at 0025Z (07/18), and landed at 0042Z (07/18).<br><br>Flight Summary<br>HS4: 1828Z-2227Z; 282 minutes wing-tip generators, 18 BIP; #1 Rocky Mountain House to Bowden, #4 Sundre to Olds.<br>HS5: 1852Z-2201Z; 236 EJ, 7 BIP; #2 Sundre, #3 Cremona to Airdrie, patrol Springbank.<br>HS3: 1927Z-2202Z; 199 EJ, 12 BIP; #1 Sylvan to Innisfail, #4 Sundre to Olds.<br>HS2: 2021Z-2312Z; 234 minutes wing-tip generators, 9 BIP; #3 Airdrie, #5 Calgary, #6 Calgary, patrol Okotoks and Turner Valley.<br>HS1: 2046Z-2321Z; 216 EJ, 11 BIP; #3 Airdrie, #5 Calgary, #6 Calgary, #7 Okotoks.<br>HS5: 2352Z (07/17)-0045Z (07/18); no seeding; patrol Calgary. |
| July 18, Friday | A jet streak was observed moving toward the coast of British Columbia, but it was expected to remain west of the area throughout the forecast period. A pulse of mid-level vorticity was forecast to produce convective rain showers in the late evening through around midnight. | No aircraft operations. |

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| | Instability was anticipated to remain very poor through the forecast period, insufficient for hail. Conditions were expected to clear by dawn.<br><br>Clouds moved into the project area over the course of the afternoon. Pulses of light rain and virga moved east through the region beginning at 22Z. They continued intermittently through the evening and overnight. The convective rain showers never reached the intensity necessary for a TITAN cell. Lightning was not observed in the project area.<br><br>44.9 max dBz<br><br>Tmax YC = 21.9C and no rain.<br>Tmax QF = 21.5C and no rain.<br>Tmax Radar = 20.4C and no rain. | |
| July 19, Saturday | A broad jet streak was in place over the project area, expected to remain there throughout the forecast period. Several modest pulses of vorticity advection were expected to force some weak thundershowers throughout the period. A shallow cold front was seen pushing south through the project area. However, it was forecast to stall and weaken during the afternoon. Despite strong wind shear, convection would be non-severe due to weak instability.<br><br>Weak afternoon rain showers turned into hailstorms by 2130Z as unexpected insolation rapidly destabilized the project area. Storm initiation occurred in the northwest project area, A long lived severe supercell tracked from Rocky Mountain House to Drumheller throughout the day. Weaker convection tracked through Sundre and the northern buffer zone during the afternoon and evening. Hail threats ended around sunset. Rain showers continued across the northern project area for the remainder of the night.<br><br>Hail up to 1.5 inch diameter was reported 7 miles SE of Rocky Mountain house. Golf ball size hail was reported 7 miles ESE of Olds. Pea size hail occurred in Innisfail. Toonie size hail fell in Bowden along with drifts of pea size hail.<br><br>Max cell top: 12.1km, 73.2* max dBz, 250.9* max VIL<br><br>*dBz and VIL values known to be exaggerated due to 3dB increase to radar constant performed by ARC (July 19th only).<br><br>Tmax YC = 26.4C and no rain.<br>Tmax QF = 21.0C and 8.4mm of rain.<br>Tmax Radar = 20.9C and 2.5mm of rain. | HS4 was launched at 2205Z for developing convection west of Rocky Mountain House. They were airborne at 2233Z. They began base seeding at 2251Z storm #1 Rocky Mountain House. When the storm reached Bowden, HS4 stopped seeding and RTB at 0047Z (07/20). They landed in YBW at 0106Z (07/20).<br><br>HS3 was launched at 2315Z for the convection near Rocky Mountain House. They were airborne at 2325Z. HS3 began top seeding storm #1 for Bowden at 2337Z. At 0037Z (07/20), HS3 stopped seeding and RTB as they were replaced by HS1. They landed in YQF at 0054Z (07/20).<br><br>HS2 was launched at 2338Z. They were airborne at 2351Z. HS2 began to patrol Sundre at 0010Z (07/20). HS2 repositioned further NW of Sundre at 0026Z (07/20). They began base seeding storm #2 Sundre at 0038Z (07/20). HS2 extended its track to begin seeding storm #3 Didsbury at 0126Z (07/20). HS2 stopped seeding at 0154Z (07/20) and patrolled Didsbury. HS2 RTB at 0157Z (07/20). They landed at 0212Z (07/20).<br><br>HS1 was launched at 0004Z (07/20). They were airborne at 0022Z. HS1 replaced HS3 and began top seeding storm #1 Bowden at 0039Z (07/20). HS1 stopped seeding and repositioned to a storm NW of Sundre at 0047Z (07/20). They began seeding storm #2 Sundre at 0056Z (07/20). HS1 extended its track and began seeding storm #3 Didsbury at 0126Z (07/20). At 0143Z (07/20) HS1 stopped seeding and patrolled Didsbury. HS1 RTB at 0148Z (07/20). They landed at 0202Z (07/20).<br><br>HS4 was launched from YBW to reposition to YQF at 0253Z (07/20). They were airborne at |

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| | | 0306Z (07/20) and landed at 0340Z (07/20).<br><br>Flight Summary<br>HS4: 2221Z (07/19)-0112Z (07/20); 232 minutes wing-tip generators, 17 BIP; #1 Rocky Mountain House to Bowden; takeoff YQF, land YBW.<br>HS3: 2318Z (07/19)-0100Z (07/20); 198 EJ, 12 BIP; #1 Bowden.<br>HS2: 2344Z (07/19)-0214Z (07/20); 154 minutes wing-tip generators, 10 BIP; #2 Sundre, #3 Didsbury.<br>HS1: 0016Z (07/19)-0205Z (07/20); 170 EJ, 12 BIP; #1 Bowden, #2 Sundre, #3 Didsbury.<br>HS4: 0258Z (07/20)-0346Z (07/20); no seeding; reposition flight; takeoff YBW, land YQF. |
| July 20, Sunday | The upper level jet stream was expected to stay over the region throughout the period. A shortwave trough looked to move eastward across the region during the afternoon hours. Strong PVA was expected with the shortwave trough. Weaker PVA then looked to occur in the evening and overnight. Model output data indicated that 500mb temperatures would cool by around 1C during the day. Area 00Z modified model soundings suggested that the troposphere would be moderately unstable with around 40 kts of effective bulk shear.<br><br>Weak thunderstorms moved eastward across the southern project area during the early morning. A wave of relatively stronger thunderstorms then developed west of the town of Caroline and moved east-southeastward across most of the project area. Ice pellets were observed at the radar at 1850Z. Storm #1 formed west of Sundre and tracked east-southeastwards toward the Crossfield area. Storm #2 developed along the foothills west of Cremona and moved toward the Airdrie area. The third hail producing thunderstorm (storm #3) of the day formed west of Calgary and slowly moved eastward across the city. Radar data indicated that grape size hail may have fallen just to the southeast of Calgary.<br><br>Max cell top: 9.9km, 66.4 max dBz, 64.7 max VIL<br><br>Tmax YC = 20.0C and 8.8mm of rain.<br>Tmax QF = 19.3C and 7.2mm of rain.<br>Tmax Radar = 18.8C and 1.5mm of rain. | HS5 was launched to a long-lived storm southwest of Sundre at 1813Z. The flight became airborne at 1827Z. They started patrolling the Cremona area at 1835Z. HS5 started top seeding storm #1 at 1855Z for Crossfield. They then extended their seeding tracks toward new development north of Cochrane at 1905Z. This new cluster of TITAN cells was moving toward Airdrie. At 1911Z, the crew started seeding storm #2 for Airdrie. HS5 then stopped seeding at 1918Z and started patrolling the same area for Airdrie. Then at 1952Z, the aircraft started patrolling the Calgary area. HS5 began finding new growth southwest of Calgary, so they started seeding storm #3 for Calgary at 2006Z. The crew continued seeding the storm as it slowly moved eastward over Calgary. Then at 2138Z, the thunderstorm was no longer a threat to the Calgary area, so they stopped seeding and RTB. The aircraft landed at 2150Z.<br><br>Flight Summary<br>HS5: 1816Z-2153Z; 243 EJ, 2 BIP; patrol Cremona, #1 Crossfield, #2 Airdrie, #3 Calgary. |
| July 21, Monday | A southwesterly jet streak was expected over southern AB through the afternoon hours. Mid-level charts showed a shortwave trough moving through the project area during the morning and afternoon. A small scale ridge was then expected to briefly build over the region in the evening and overnight. Area 18Z modified model soundings indicated that the troposphere would be moderately unstable with around 20 kts of effective bulk shear.<br><br>Thunderstorms began developing over the southern foothills in the early morning. This rather large cluster of | A radar tour was conducted at the Olds-Didsbury airport and 18 people were in attendance.<br><br>HS4 flew a PR flight. The flight was airborne out of YQF at 1645Z and landed in EA3 at 1706Z.<br><br>HS4 then flew a return PR flight. The aircraft was airborne out of EA3 at 2223Z and landed in YQF at 2240Z. |

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| | storms eventually pushed eastward across the entire project area in the late morning and early afternoon. The strongest thunderstorm of the day formed over the foothills west of Turner Valley and tracked southeastward through the southern buffer zone. Radar data indicated that a very small area southwest of High River may have seen golf ball size hail. No cities in the project area were threatened. Isolated convective rain showers then fell over parts of the region in the late afternoon. No significant weather occurred in the evening and overnight.<br><br>Max cell top: 10.6km, 66.8 max dBz, 103.5 max VIL<br><br>Tmax YC = 19.9C and 2.0mm of rain.<br>Tmax QF = 19.2C and 5.6mm of rain.<br>Tmax Radar = 19.1C and 3.8mm of rain. | Flight Summary<br>HS4: 1627Z-1709Z; no seeding; PR flight; takeoff YQF, land EA3.<br>HS4: 2220Z-2242Z; no seeding; PR flight; takeoff EA3, land YQF. |
| July 22, Tuesday | The upper level jet was forecast to weaken and shift north of the project area. 500mb heights looked to continue rising slightly over the region through 00Z. Thus, the upper level ridge was expected to continue influencing the area through around the time of peak heating. Nonetheless, two waves of vorticity looked to move northeastward across the region during the afternoon and evening. Surface winds were expected to stay southeasterly for most of the forecast period. Area modified model soundings indicated that a moderately unstable air mass was in place over the area with around 20 kts of effective bulk shear.<br><br>Weak isolated echoes were observed on radar through the early afternoon. A wave of convection then started moving northeastward across the region in the late afternoon. This disturbance triggered isolated thunderstorms along the foothills in the late afternoon. The strongest thunderstorm of the day formed west of Rocky MH at 22Z. This storm slowly moved east-northeastward. The thunderstorm then quickly dissipated after moving off the foothills into the project area. It did not reach Rocky MH. Radar data showed that grape size hail may have fallen west of Rocky MH. No echoes were observed on radar overnight.<br><br>Max cell top: 9.9km, 61.6 max dBz, 34.8 max VIL<br><br>Tmax YC = 22.9C and no rain.<br>Tmax QF = 23.3C and no rain.<br>Tmax Radar = 22.2C and no rain. | HS4 was launched at 0042Z (07/23) for a slow moving cell approaching Rocky MH. The aircraft was airborne at 0102Z (07/23). They began patrolling Rocky MH at 0125Z (07/23). The cell diminished and was not a hail threat, so HS4 RTB at 0212Z (07/23). No seeding occurred. They landed at 0230Z (07/23).<br><br>Flight Summary<br>HS4: 0050Z (07/23)-0236Z (07/23); no seeding; patrol Rocky MH. |
| July 23, Wednesday | An upper level jet streak was projected to start nosing its way into the area from BC during the late evening hours. Upper level diffluence was expected. PVA looked to occur off and on throughout the period. 500mb charts indicated that a closed low would move into southern AB during the overnight hours. Warm moist air at the low levels was expected over the region throughout the forecast period. Surface winds looked to stay out of the southeast. Modified model soundings suggested that a loaded gun situation would be in place during the daytime hours. Unstable tropospheric conditions were expected | HS5 was launched at 0018Z (07/24) to convection west of Calgary. The flight became airborne at 0035Z (07/24). Then at 0053Z (07/24) HS5 started patrolling southwest of Calgary. HS5 was not finding any significant convective growth southwest of Calgary at 0226Z (07/24), so they stopped patrolling and RTB. The aircraft landed at 0244Z (07/24).<br><br>HS1 was launched to a line of thunderstorms southwest of High River at 0230Z (07/24). The |

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| | through the night.<br><br>Light convective rain showers fell over the southern and eastern parts of the area in the morning. Towering cumulus clouds were observed along the foothills in the early afternoon. In the late afternoon, a few of these towering cumulus clouds formed TITAN cells. In the late evening, a wave of embedded elevated thunderstorms pushed into the area from the south at roughly 0330Z (07/24). This line of thunderstorms quickly pushed northward across the entire project area during the early nighttime hours. Storm #1 moved northward through High River, Okotoks, Calgary, Airdrie, and Carstairs. Radar data indicated that walnut size hail may have fallen southeast of High River. According to radar data, grape size hail was possible over the northwestern part of Calgary.<br><br>Max cell top: 13.6km, 63.4 max dBz, 79.1 max VIL<br><br>Tmax YC = 25.8C and 3.4mm of rain.<br>Tmax QF = 24.3C and no rain.<br>Tmax Radar = 23.8C and no rain. | aircraft became airborne at 0250Z (07/24). They started patrolling south of High River at 0303Z (07/24). At 0350Z (07/24) HS1 was finding growth and inflow, so they started top seeding storm #1 for High River. HS1 continued seeding the storm as it moved northward through Okotoks, Calgary, Airdrie, and Carstairs. HS1 RTB at 0522Z (07/24). They landed at 0600Z (07/24).<br><br>Flight Summary<br>HS5: 0025Z (07/24)-0248Z (07/24); no seeding; patrol Calgary.<br>HS1: 0242Z (07/24)-0604Z (07/24); 213 EJ, 21 BIP; #1 High River to Carstairs. |
| July 24, Thursday | Upper level charts showed that jet energy would likely stay east and south of the area. The mid and upper level closed low was expected to be centered over the northern project area during peak heating. 500mb temperatures looked to cool by roughly 5C during the day. Surface dew points looked to slowly fall during the afternoon. Area modified model soundings suggested that moderately strong pulse thunderstorms were a possibility.<br><br>Isolated convective rain showers fell over the northern half of the protected area in the morning. The early afternoon then saw isolated towering cumulus and cumulonimbus clouds. In the late afternoon and early evening, several weak TITAN cells formed over the northern part of the project area. A few lightning strikes were observed over the area. Radar data indicated that grape size hail may have fallen over a very small area northwest of Lacombe. Stratiform rain showers occurred over the northern project area overnight.<br><br>Max cell top: 8.4km, 58.7 max dBz, 32.7 max VIL<br><br>Tmax YC = 21.2C and 0.4mm of rain.<br>Tmax QF = 22.0C and 0.4mm of rain.<br>Tmax Radar = 21.2C and 1.0mm of rain. | No aircraft operations. |
| July 25, Friday | Upper level charts showed jet energy would stay south of the international border. The mid and upper level cold core closed low was expected to be over SK for most of the forecast period. Several lobes of vorticity were expected to rotate counter-clockwise around the low. Surface winds looked to remain northwesterly and breezy throughout the period. Modified model soundings showed the atmosphere would be slightly unstable. Instability was not sufficient for thunderstorms. | HS1 flew a maintenance flight. The aircraft was airborne out of YBW at 1345Z and landed in YYC at 1400Z.<br><br>Flight Summary<br>HS1: 1342Z-1405Z; no seeding; MX flight; takeoff YBW, land YYC. |

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| | Stratiform rain showers fell over the area through the night. Isolated areas of embedded convective rain showers were observed on radar. The embedded convection mainly occurred over the southern half of the project area. The northeastern quadrant of the protected area saw the highest rainfall totals. Very gusty surface winds persisted through the daytime hours. Severe wind gusts were reported across the region. Winds brought down tree branches in Red Deer and Calgary. Overnight, the winds gradually diminished.<br><br>Max cell top: 5.4km, 54.2 max dBz, 9.5 max VIL<br><br>Tmax YC = 18.2C and a trace of rain.<br>Tmax QF = 13.0C and 16.8mm of rain.<br>Tmax Radar = 15.1C and 5.6mm of rain. | |
| July 26, Saturday | Upper level charts continued to show that the main jet core would stay south of the international border. At the mid-levels, a ridge was expected to build over southern AB throughout the period. As a result, PVA was expected to be weak. Surface winds looked to become light and variable starting around the time of peak heating. The air mass in place over the area was expected to be only slightly unstable with only 15 kts of effective bulk shear.<br><br>Convective rain showers fell over the northeastern part of the region in the morning and early afternoon. Isolated towering cumulus clouds were observed near the foothills in the late afternoon and early evening. The skies then cleared in the late evening and remained mostly clear for the remainder of the period.<br><br>Max cell top: 4.6km, 48.9 max dBz, 4.5 max VIL<br><br>Tmax YC = 22.6C and a trace of rain.<br>Tmax QF = 20.1C and 2.6mm of rain.<br>Tmax Radar = 20.2C and no rain. | No aircraft operations. |
| July 27, Sunday | The upper-level jet was south of the region and was expected to remain there through the forecast period. A few weak mid-level impulses of vorticity were expected to move through north of the area, producing convection that was forecast to move into the northern project area. There were no significant surface features in the project region, though upslope flow and a lee trough were expected.<br><br>The cap held. No significant convection occurred. Skies remained mostly clear across the project area. There were no TITAN cells. No lightning occurred in the project.<br><br>35.2 max dBz.<br><br>Tmax YC = 26.5C and no rain.<br>Tmax QF = 24.8C and no rain.<br>Tmax Radar = 24.5C and no rain. | HS1 flew a maintenance flight. The flight was airborne out of YYC at 1531Z and landed in YBW at 1542Z.<br><br>Flight Summary<br>HS1: 1518Z-1545Z; no seeding; MX flight; takeoff YYC, land YBW. |
| July 28, Monday | A broad upper-level jet streak was expected to remain south of the region. A strong pulse of mid-level vorticity | No aircraft operations. |

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| | advection was forecast to move through extreme southern Alberta, just south of the project area. No significant surface features were present, and only weak upslope flow was expected.<br><br>No significant weather occurred in the project area. Isolated weak rain showers developed near Rocky Mountain House, but did not produce hail or lightning. There were no TITAN cells in the project area.<br><br>43.2 max dBz<br><br>Tmax YC = 28.1C and no rain.<br>Tmax QF = 25.9C and no rain.<br>Tmax Radar = 25.2C and no rain. | |
| July 29, Tuesday | An upper-level ridge sat over the project area. No mid-level vorticity advection was expected. Broad surface high pressure slowly drifted east over Saskatchewan, leaving weak southerly flow in project area. Significant instability was expected, but convection was anticipated to be hindered by poor shear, a considerable cap, and dry mid-level air. Convection was expected in the foothills and mountains. However, it was not forecast to move into the project area due to weak mid-level winds.<br><br>Convection initiated in the foothills at19Z. Cells slowly moved ENE, and a few cells progressed several miles into the western project area before dissipating. Storms were generally short-lived, but did pulse to significant hail intensity (according to radar). After 00Z, storms propagated further east into the project area, and radar indicated one cell may have produced grape size hail in Cremona. Radar also indicated golf ball size hail may have occurred just inside the project boundary, 22 miles south of Rocky Mountain House. There was lightning in the project area.<br><br>Max cell top: 12.9km, 66.7 max dBz, 109.5 max VIL<br><br>Tmax YC = 31.7C and no rain.<br>Tmax QF = 29.0C and no rain.<br>Tmax Radar = 28.9C and a trace of rain. | A radar tour was conducted at the Olds-Didsbury airport and 17 people were in attendance.<br><br>HS5 flew a PR flight. The flight was airborne from YBW at 1706Z and landed at EA3 at 1729Z.<br><br>HS5 was launched at 2235Z for pulse convection threatening Sundre. The flight was airborne from EA3 at 2250Z. They began patrolling Sundre at 2305Z. Cells dissipated. HS5 RTB at 2312Z and landing Springbank at 2323Z.<br><br>Flight Summary<br>HS5: 1646Z-1733Z; no seeding; PR flight; takeoff YBW, land EA3.<br>HS5: 2242Z-2326Z; no seeding; patrol Sundre; takeoff EA3, land YBW. |
| July 30, Wednesday | An upper-level ridge continued to reside over the project area. There were no jet-stream impulses across the region. Mid-level vorticity advection was expected to be negligible. Extreme instability was anticipated, especially during the afternoon peak heating. Wind shear was forecast to be particularly poor, and there was a modest cap expected over the project area. Convection was expected in the foothills. With exceptionally light mid-level winds, it was not expected to become a threat in the project area. Conditions were expected to clear overnight, however renewed convection was forecast for Thursday morning as a cold front and low pressure system developed and approached the northern project area.<br><br>Convection initiated around briefing time (18Z) on the | HS2 was launched at 2325Z for convection slowly moving east into the project area near Cochrane. They were airborne at 2337Z. HS2 began base seeding storm #1 Cochrane at 2347Z. HS2 stopped seeding and began patrolling Cochrane at 0013Z (07/31). HS2 RTB at 0101Z (07/31), and landed at 0112Z (07/31).<br><br>HS1 was launched at 2325Z for mature convection west of Cochrane. They were airborne at 2341Z. HS1 began patrolling Cochrane at 2350Z. They RTB at 0013Z (07/31). HS1 landed at 0025Z (07/31).<br><br>Flight Summary |

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| | foothills. It did not affect the project area until 23Z. At that time, storm #1 crossed the western project boundary NW of Cochrane. It dissipated almost immediately after crossing the western project border. At almost the same time, a cell developed in the southeast buffer zone 16 miles north of Vulcan. Radar indicated this cell may have produced grape size hail in this area. After 00Z, foothills convection gradually decreased in coverage and intensity. A few weak rain showers developed in the northwest project area and buffer, but never posed a hail threat. Conditions were dry and stable after 6Z. There was lightning in the project area.<br><br>Max cell top: 10.6km, 63.2 max dBz, 46.1 max VIL<br><br>Tmax YC = 32.2C and 0.4mm of rain.<br>Tmax QF = 29.3C and no rain.<br>Tmax Radar = 28.2C and no rain. | HS2: 2327Z (07/30)-0115Z (07/31); 54 min wing-tip generators, 3 BIP; #1 Cochrane.<br>HS1: 2334Z (07/30)-0028Z (07/31); no seeding; patrol Cochrane. |
| July 31, Thursday | Upper-level flow was generally zonal, with no jet energy expected. Moderate mid-level vorticity advection was a concern from the afternoon through the night in the northern project area. Surface winds were forecast to become northeasterly in the afternoon, leading to upslope convection. Very high instability was anticipated, along with modest mid-level winds capable of pushing foothills convection into the project area.<br><br>Convection initiated in the foothills around 19Z, though cells remained isolated and relatively weak until 2030Z. Around that time, a significant multi-cell thunderstorm developed on the foothills and drifted southeast. This complex became storm #1 for the day as it crossed the project boundary and threatened Cochrane. At 2315Z, the storm dissipated, and attention turned to developing convection further south. Storm #2 developed just west of the project border, and its trajectory threatened the Turner Valley area. Storm #2 died relatively quickly after entering the project area, and radar indicated it did not produce hail in the towns of Turner Valley or Black Diamond. At 0030Z, a new multi-cell thunderstorm began to move off the foothills into the project area approximately 20 miles southwest of Calgary. This thunderstorm complex also appeared to be a threat for Turner Valley, and became storm #3 at 0105Z. It weakened and turned east before making it to Turner Valley, and did not produce hail in a project city. The last major storm (#4) of the period developed over the foothills and mountains west of Rocky MH in the late evening. This storm was initially slow moving while it was over the foothills. The storm then sped up as it pushed into the northern project area in the very late evening. This multicellular storm system intensified into a bow echo as it moved eastward across the northern project area. There was lightning in the project area.<br><br>Max cell top: 15.9km, 67.3 max dBz, 156.9 max VIL<br><br>Tmax YC = 27.4C and a trace of rain.<br>Tmax QF = 25.7C and no rain. | HS5 was launched at 2204Z for threatening convection west of Cochrane. They were airborne at 2219Z. At 2227Z, HS5 began patrolling Cochrane. HS5 began top seeding at 2256Z storm #1 Cochrane. They stopped seeding at 2326Z and began patrolling Calgary. HS5 RTB at 0028Z (08/01) and landed at 0125Z (08/01).<br><br>HS2 was launched at 2204Z for threatening convection west of Cochrane. They were airborne at 2217Z. At 2227Z HS2 began patrolling Cochrane. HS2 began base seeding storm #1 Cochrane at 2247Z. At 2326Z HS2 stopped seeding and repositioned to Black Diamond. HS2 began seeding storm #2 Turner Valley at 2342Z. They stopped seeding at 0005Z (08/01) to reposition and begin patrolling Calgary. HS2 repositioned back to Turner Valley at 0040Z (08/01). They began seeding #3 Turner Valley at 0105Z (08/01). HS2 stopped seeding and RTB at 0130Z (08/01). They landed at 0142Z (08/01).<br><br>HS1 was launched at 2345Z. They were airborne at 0005Z (08/01). HS1 began patrolling Calgary at 0007Z (08/01). They repositioned toward High River at 0142Z (08/01), and began patrol of High River at 0150Z (08/01). HS1 then repositioned toward southwest Calgary at 0205Z (08/01). They began to patrol Calgary at 0213Z (08/01). HS1 repositioned to Turner Valley at 0215Z (08/01), and began to patrol for Turner Valley at 0217Z (08/01). HS1 RTB at 0126Z (08/01), and they landed at 0236Z (08/01).<br><br>HS5 was launched to a rather large and fast moving storm northwest of Sundre at 0514Z (08/01). The flight became airborne at 0533Z (08/01) and climbed to cloud top. At 0551Z |

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| | Tmax Radar = 23.8C and no rain. | (08/01) HS5 started top seeding storm #4 for Sundre. They then stopped seeding and RTB at 0605Z (08/01). The aircraft landed at 0623Z (08/01).<br><br>HS2 was launched at 0522Z (08/01) to a large and tall storm northwest of Sundre. The aircraft was airborne at 0543Z (08/01) and climbed to the base seeding altitude. HS2 started base seeding storm #4 at 0601Z (08/01) for Sundre. Then at 0605Z (08/01) the crew stopped seeding and RTB. They landed at 0624Z (08/01).<br><br>Flight Summary<br>HS5: 2206Z (07/31)-0128Z (08/01); 45 EJ, 5 BIP, #1 Cochrane, patrol Calgary.<br>HS2: 2210Z (07/31)-0144Z (08/01); 174 min wing-tip generators, 6 BIP; #1 Cochrane, #2 Turner Valley, #3 Turner Valley, patrol Calgary.<br>HS1: 2358Z (07/31)-0238Z (08/01); no seeding; patrol Calgary, patrol High River, patrol Turner Valley.<br>HS5: 0520Z (08/01)-0626Z (08/01); 8 EJ, 1 BIP; #4 Sundre.<br>HS2: 0531Z (08/01)-0627Z (08/01); 14 minutes wing-tip generators; #4 Sundre. |
| August 1, Friday | A relatively weak upper-level jet streak was located over northern Alberta and was not expected to impact the project area's weather. Mid-level winds were predicted to be slightly stronger than previous days, and any foothills convection was expected to move into the project area. Instability was forecast to be exceptionally high, and wind shear, while weak, was indicative of rotating storms. The cap over the plains was expected to be relatively weak. A couple weak pulses of mid-level vorticity were expected; namely one in the northern project area in the late evening and a second approaching the southern project area Saturday morning.<br><br>Weak convection began to develop in the western buffer around 22Z. Storms moved rather slowly, and did not survive after moving off the foothills. Rain showers began developing in the project area around 4Z, but they were not hail threats. Stronger convection began to develop at 0515Z in the northeast buffer zone. Cells were short-lived, but briefly reached a high intensity on radar. Radar indicated golf ball size hail may have occurred in the strongest of these storms, 23 miles east of Red Deer. There was lightning in the project area.<br><br>Max cell top: 11.4km, 68.4 max dBz, 113.8 max VIL<br><br>Tmax YC = 27.1C and a trace of rain.<br>Tmax QF = 24.5C and 4.4mm of rain.<br>Tmax Radar = 24.2C and 0.8mm of rain. | No aircraft operations. |
| August 2, Saturday | An upper-level ridge was expected to build over the region during the afternoon, followed by a closed low | HS2 performed a maintenance flight. They were airborne at 2350Z and landed at 2357Z. |

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| | overnight into Sunday. A substantial area of vorticity advection was seen just southeast of the project area, but was forecast to remain far enough east to not be a convective factor. A second, weaker lobe of vorticity was anticipated to move off the foothills and through the project area from the evening into the overnight hours. Instability was expected to be substantial, with significant elevated instability overnight. However, with a strong cap over the plains, weak mid-level winds, and poor wind shear, storms were not expected to affect the project area until this vorticity advection occurred.<br><br>Convection initiated over the foothills shortly after 18Z. Cells were very slow moving, and generally dissipated quickly upon leaving the foothills. Two different cells did clip the western project border, but neither produced significant hail in the project area. Thunderstorms gradually weakened into rain showers by 2330Z, except for the southern buffer area where stronger activity continued. Convection completely dissipated across the region by 6Z. At 9Z, convection began to develop in the extreme southeast project area and buffer. This convection was rather disorganized and slow moving, but radar indicated one cell may have produced brief golf ball size hail on the border of the southeastern buffer zone. Lightning did occur in the project area.<br><br>Max cell top: 13.6km, 65.6 max dBz, 114.0 max VIL<br><br>Tmax YC = 27.5C and no rain.<br>Tmax QF = 26.7C and no rain.<br>Tmax Radar = 26.9C and 0.3mm of rain. | Flight Summary<br>HS2: 2348Z-2359Z; no seeding; MX flight. |
| August 3, Sunday | Upper level jet energy looked to stay east and south of the region. A mid and upper level open wave low was expected to move eastward into the area. Vorticity advection looked to be abundant throughout the forecast period. Warm moist air was expected to stay in place over the region. The 600mb wind direction suggested that convection would move westward. Area modified model soundings indicated that the entire region would be fairly unstable during the day and night.<br><br>Elevated storms occurred south and southeast of Strathmore during the early morning hours. Multicellular thunderstorms began forming directly over the project area in the afternoon. A few of these storms grew tall and strong enough to produce hail. Lee cyclogenesis occurred directly over the project area. The formation of the low caused storms to track westward over the northern part of the protected area and eastward over the southern part of the project area. Radar data showed that golf ball size hail may have fallen southeast of the town of Caroline. Storm #1 formed southeast of Rocky MH and slowly tracked south-southwestward through the Sundre area. Storm #2 formed just to the south of Cochrane. This intensifying storm started back building directly over the city of Cochrane. Starting at roughly 23Z storm #2 began moving eastward over western Calgary. This hail producing thunderstorm became linear and | HS3 was launched at 2056Z to a cluster of thunderstorms south of Rocky MH. The aircraft became airborne at 2113Z. HS3 started top seeding storm #1 for Sundre at 2131Z. The crew continued seeding the storm as it gradually moved south-southwestward towards Sundre. HS3 then repositioned to the Innisfail area at 2235Z. At 2254Z, HS3 started seeding storm #3 for the Red Deer area. Then at 2342Z, HS3 was finding no new growth so they stopped seeding and started patrolling the same area. They stopped patrolling and RTB at 2349Z. The flight landed at 2356Z.<br><br>HS5 was launched at 2112Z in order to patrol for Calgary. The flight was airborne at 2130Z and started patrolling northwest of the Calgary area. At 2223Z HS5 started top seeding storm #2 for Cochrane. The crew continued seeding this thunderstorm as it back built over the city of Cochrane. HS5 then stopped seeding at 2235Z and started patrolling for Calgary. They were then redirected to new growth over the western Calgary area and started seeding storm #2 again for Calgary at 2300Z. HS5 extended their line northward to convective cells west of Airdrie at 0006Z (08/04). At |

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| | slowly tracked eastward over Calgary. The next storm (#3) of the day formed east of Innisfail and extended to the east of Red Deer. This oblong storm gradually tracked westward across the QE2 highway. More convection then started forming west of Cochrane in the early evening. The intensifying line of thunderstorms (storm #4) moved eastward across Calgary. Radar data indicated that grape size hail may have fell over western and southern Calgary. Ice pellets were reported over northeastern Calgary.<br><br>Max cell top: 15.1km, 66.9 max dBz, 142.8 max VIL<br><br>Tmax YC = 26.7C and 7.8mm of rain.<br>Tmax QF = 26.6C and 7.6mm of rain.<br>Tmax Radar = 24.3C and 9.9mm of rain. | 0023Z (08/04) HS5 resumed top seeding storm #2 for Calgary. They stopped seeding and RTB at 0031Z (08/04). The aircraft landed at 0040Z (08/04).<br><br>HS4 was launched to growing convection east of Red Deer at 2251Z. The aircraft was airborne at 2308Z and started climbing up to the base seeding altitude while enroute to the thunderstorm. They then started base seeding storm #3 for Red Deer at 2318Z. At 2340Z, the crew was finding no inflow, so they stopped seeding and RTB. They landed at 2345Z.<br><br>HS2 was launched to a tall and slow moving storm over western Calgary at 2307Z. The flight became airborne at 2325Z. HS2 started base seeding storm #2 for Calgary at 2330Z. The crew continued seeding this elongated, north-south oriented storm as it slowly tracked eastward over Calgary. At 0041Z (08/04) the crew was no longer finding any inflow over Calgary, so they stopped seeding and RTB. The flight landed at 0049Z (08/04).<br><br>HS1 was launched to a long line of thunderstorms moving toward Airdrie and Calgary at 0006Z (08/04). The aircraft was airborne at 0029Z (08/04) and started climbing to the top seeding altitude over the Cochrane area. HS1 then repositioned a short distance to a TITAN cell west of Cochrane and started top seeding storm #4 for Cochrane at 0038Z (08/04). The crew continued seeding this storm as it moved eastwards over Calgary. Then at 0136Z (08/04) HS1 descended to shed ice. The storm started weakening, so they stopped seeding and RTB at 0155Z (08/04). The flight landed at 0209Z (08/04).<br><br>Flight Summary<br>HS3: 2105Z (08/03)-0000Z (08/04); 215 EJ, 14 BIP; #1 Sundre, #3 Penhold and Red Deer.<br>HS5: 2118Z (08/03)-0042Z (08/04); 213 EJ, 8 BIP; #2 Cochrane to Calgary.<br>HS4: 2300Z-2349Z; 44 minutes wing-tip generators, 1 BIP; #3 Red Deer.<br>HS2: 2318Z (08/03)-0052Z (08/04); 144 minutes wing-tip generators, 11 BIP; #2 Calgary.<br>HS1: 0022Z (08/04)-0211Z (08/04); 103 EJ, 16 BIP; #4 Cochrane to Calgary to Okotoks. |
| August 4, Monday | An upper level jet core was prognosticated to be over the far southeastern part of AB. An open wave, mid and upper level low was expected to be centered over the foothills during the daytime hours. Although PVA looked to occur throughout the forecast period, it was expected to be strongest during the late afternoon and early evening. Low level charts indicated that warm moist air | HS1 was launched to convection west of Cochrane at 1935Z. The aircraft became airborne at 1955Z. They then started top seeding storm #1 for Cochrane at 2002Z. HS1 reported only minimal growth near the storm, so they stopped seeding and repositioned to the west of Turner Valley at 2011Z. Then at |

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| | would stay in place over the area throughout the day and night. A weak low level jet looked to nose its way into the region during the overnight hours. At the surface, the wind was expected to be easterly. Area modified model soundings suggested that the troposphere would be fairly unstable with around 20kts of effective bulk shear.<br><br>Scattered convective rain showers fell over the far northern part of the project area in the morning. In the early afternoon, convection quickly developed over the foothills. These convective storms then started pushing into the project area during the midafternoon. Storm #1 formed west of Cochrane and moved east-northeastward through Airdrie. Storm #2 developed over the foothills west of Turner Valley. This storm tracked eastward toward Turner Valley but diminished before reaching the town. Another storm (#3) then formed directly over Calgary and tracked east-northeastward over the northern part of the city. The next storm (#4) formed along the foothills southwest of Sundre and tracked northeastward through Red Deer. In the late afternoon, a rapidly intensifying storm (#5) formed directly over Red Deer and tracked northward through the town of Blackfalds. The last hail producing storm of the day grew west of Innisfail and moved northeastward through Penhold and Red Deer. Radar data suggested that golf ball size hail fell west of High River and walnut size hail may have fallen over a very small area in northeastern Calgary. The southern part of the project area saw scattered convective rain showers during the nighttime hours.<br><br>Golf ball size hail was reported west of High River near the town of Longview.<br><br>Max cell top: 13.6km, 69.1 max dBz, 192.3 max VIL<br><br>Tmax YC = 21.9C and 3.3mm of rain.<br>Tmax QF = 23.1C and 24.6mm of rain.<br>Tmax Radar = 22.1C and no rain. | 2029Z they started seeding storm #2 for Turner Valley. At 2045Z, HS1 stopped seeding and was redirected to near Calgary for patrol. They started patrolling west of Calgary at 2054Z. The crew then started seeding storm #1 again for Cochrane at 2106Z. HS1 continued top seeding the storm as it slid east-northeastward toward Airdrie. They next repositioned to storm #3 over northern Calgary at 2147Z and started seeding this thunderstorm. The crew then stopped seeding and descended to the base seeding altitude at 2235Z in order to shed ice. At this same time, HS1 started patrolling at the base seeding altitude for Strathmore. They then stopped patrolling and RTB at 2239Z. The flight landed at 2248Z.<br><br>HS2 was launched at 1946Z to an intensifying storm west of Cochrane. The flight was airborne at 2004Z. HS2 started base seeding storm #1 for Cochrane at 2013Z. They then stopped seeding at 2030Z and started patrolling for Calgary. HS2 reported finding consistent inflow at 2048Z, so they started seeding storm #1 again. The crew continued seeding the storm as the thunderstorm moved from the Cochrane area to Airdrie. At 2159Z HS2 stopped seeding and RTB. They landed at 2205Z.<br><br>HS5 was launched at 1954Z to a storm developing over the foothills west of Turner Valley. They became airborne at 2011Z. At 2020Z HS5 began base seeding storm #2 for Turner Valley. They then reported finding limited inflow along the storm, so they stopped seeding and started patrolling the Calgary area at 2112Z. HS5 found decent growth over northern Calgary, so they started top seeding storm #3 for Calgary at 2135Z. The crew then stopped seeding and resumed patrolling for the Calgary area at 2146Z. At 2204Z they repositioned to an intensifying multicellular storm west of Olds. HS5 started top seeding storm #4 for Olds at 2215Z. The crew then stopped seeding and RTB at 2249Z. They landed at 2305Z.<br><br>HS4 was launched to a growing thunderstorm west of Olds at 2205Z. The aircraft was airborne at 2228Z. They started base seeding storm #4 for Olds at 2240Z. At 2258Z HS4 stopped seeding and repositioned to the Red Deer area. They then started seeding storm #5 for Red Deer at 2308Z. HS4 continued seeding as the storm slowly moved northward toward Blackfalds. At 2358Z, the crew stopped seeding and RTB. They landed at 0040Z (08/05). |

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| | | HS3 was launched at 2230Z to a long-lived storm moving towards the town of Strathmore. The flight became airborne at 2246Z and was redirected to new development over the Red Deer area. At 2255Z they started top seeding storm #5 for Red Deer. The crew continued seeding the relatively slow moving storm as it tracked northward toward Blackfalds. Then at 2349Z HS3 stopped seeding and repositioned to the south of Red Deer. At 2352Z they started seeding storm #6 for Penhold and Red Deer. At 0012Z (08/05) the crew stopped seeding and RTB. The aircraft landed at 0025Z (08/05).<br><br>HS2 was launched to a tall and growing storm southwest of Calgary at 2257Z. The aircraft was airborne at 2312Z and started patrolling over the Cochrane area. At 2339Z HS2 stopped patrolling and RTB. They landed at 2346Z.<br><br>Flight Summary<br>HS1: 1948Z-2251Z; 253 EJ, 19 BIP; #1 Cochrane to Airdrie, #2 Turner Valley, #3 Calgary, patrol Strathmore.<br>HS2: 1956Z-2209Z; 178 minutes wing-tip generators, 12 BIP; #1 Cochrane to Airdrie, patrol Calgary.<br>HS5: 2002Z-2308Z; 105 EJ, 15 BIP; #2 Turner Valley; #3 Calgary, #4 Olds.<br>HS4: 2216Z (08/04)-0050Z (08/05); 136 minutes wing-tip generators, 4 BIP; #4 Olds, #5 Red Deer to Blackfalds.<br>HS3: 2238Z (08/04)-0029Z (08/05); 300 EJ, 21 BIP; #5 Red Deer to Blackfalds, #6 Red Deer and Penhold.<br>HS2: 2308Z-2350Z; no seeding; patrol Cochrane. |
| August 5, Tuesday | Jet energy at the upper levels looked to stay well south of the area. The mid and upper level open wave low was centered over central AB and was expected to move east of the area during the daytime hours. PVA looked to occur during the afternoon. Warm moist air was prognosticated to stay in place over the region through the overnight hours. Surface winds looked to be out of the southeast. Thermodynamic modified model soundings suggested that the atmosphere would be fairly unstable. A strong cap looked to form at the low levels late in the period.<br><br>In the morning, convective rain showers fell over the eastern part of the region. Mainly cumulus clouds were then observed over the project area during the afternoon and evening. Overnight, a few scattered convective rain showers fell over the northwest part of the area. No lightning strikes were observed inside the project area.<br><br>Max cell top: 5.4km, 49.2 max dBz, 6.7 max VIL | HS2 flew a maintenance flight. The aircraft was airborne out of YBW at 1326Z and landed in YQF at 1353Z.<br><br>HS2 flew a maintenance flight. The aircraft was airborne out of YQF at 1942Z and landed in YBW at 2021Z.<br><br>Flight Summary<br>HS2: 1318Z-1358Z; no seeding, maintenance flight; takeoff YBW, land YQF.<br>HS2: 1928Z-2025Z; no seeding, maintenance flight; takeoff YQF, land YBW. |

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| | Tmax YC = 24.2C and no rain.<br>Tmax QF = 24.0C and no rain.<br>Tmax Radar = 22.7C and no rain. | |
| August 6, Wednesday | A 65 knot jet core was expected to start nosing its way into central AB during the late afternoon. Midlevel charts showed that the region would be in westerly flow with no significant perturbations during the daytime. Weak PVA looked to occur during the overnight hours. Warm moist air looked to stay in place at the low levels throughout the period. Lee cyclogenesis was expected during the overnight hours. A weak cold front was prognosticated to slide into the northwest part of the project area in the evening. The troposphere was fairly unstable with CAPE values around 900 J/kg. Effective bulk shear was approximately 40 kts.<br><br>Thunderstorms began forming over the northern foothills during the early afternoon hours. One of these storms (#1) intensified into a supercell west of Sundre and tracked east-southeastward through the town of Cremona. This thunderstorm eventually dissipated west of Carstairs. The majority of the storms along the foothills dissipated after trying to push into the protected area. The next major storm (#2) developed over the foothills west of Sundre during the late afternoon and moved southeastward into the project area. This long-lived strong thunderstorm moved through the town of Cremona. Then at 0030Z (08/07) a strong push of vigorous new growth occurred along the southern edge of this storm. The new growth along storm #2 then moved through the city of Airdrie. Radar data suggested that golf ball size hail may have fallen northwest of Airdrie. Starting at roughly 0200Z (08/07) a cold front started to push into the northern buffer zone. The cold front triggered off numerous TITAN cells as it pushed into the northern project area. Storm #3 formed west of Rocky MH and eventually moved through Rocky MH. The next significant storm (#4) develop west of Sylvan pushed eastward across the region. The last seeded storm (#5) of the day formed west of Innisfail and tracked eastward. A large cluster of storms then developed over the northern part of the project area during the overnight hours. This system gradually pushed eastward overnight.<br><br>Greater than golf ball size hail was reported roughly 5 miles north of Airdrie. Up to toonie size hail was observed in Airdrie. Terry Krauss reported walnut size hail north of Airdrie on the QE2 highway at 0146Z (08/07).<br><br>Max cell top: 15.1km, 68.3 max dBz, 143.6 max VIL<br><br>Tmax YC = 27.6C and no rain.<br>Tmax QF = 26.2C and 3.0mm of rain.<br>Tmax Radar = 25.6C and no rain. | A radar tour was conducted at the Olds-Didsbury airport with 16 people in attendance.<br><br>HS1 flew a PR flight. They were airborne out of YBW at 1653Z and landed in EA3 at 1711Z.<br><br>HS1 was launched at 2109Z to a strong thunderstorm beginning to push off the foothills west of Sundre. The flight became airborne out of EA3 at 2119Z and started climbing up to the top seeding altitude while enroute to the thunderstorm. Upon reaching the storm, HS1 quickly found growth and started top seeding storm #1 at 2131Z for Cremona. The crew continued seeding the storm as it tracked east-southeastward through Cremona and toward Airdrie. Then at 2315Z, HS1 stopped seeding and repositioned to a supercell northwest of Cremona. They started seeding storm #2 for Cremona at 2320Z. At 0047Z (08/07), they were running low on fuel and flares, so they RTB. They landed in YBW at 0058Z (08/07).<br><br>HS2 was launched at 2113Z to a supercell west of Sundre. The aircraft was airborne at 2129Z. HS2 reported consistent inflow and a decent shelf cloud, so they started base seeding storm #1 for Cremona at 2146Z. The crew continued seeding the storm as it tracked east-southeastward through Cremona and toward Airdrie. At 2304Z, HS2 continued seeding using the aircraft's wing-tip generators as they repositioned to a larger and taller storm northwest of Cremona. They started seeding storm #2 for Cremona at 2310Z. At 2345Z, HS2 was running low on seeding material, so they RTB. They landed at 2356Z.<br><br>HS4 flew a maintenance flight. The flight was airborne at 2149Z and landed at 2155Z.<br><br>HS4 was launched at 2309Z to a long-lived storm west of Carstairs. The aircraft became airborne at 2327Z and was redirected to a supercell near the town of Cremona. Then at 2350Z they started base seeding storm #2 for Cremona. HS4 replaced HS2 with base seeding the thunderstorm for Cremona. The crew continued seeding the storm as it moved through Airdrie and toward Beiseker. At 0203Z (08/07) the storm was rapidly diminishing, so they stopped seeding and RTB. They landed at 0224Z (08/07).<br><br>HS5 was launched for a strong, long-lived tall |

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| | | storm at 2350Z. The flight was airborne at 0007Z (08/07) and started climbing to top seeding altitude over Cochrane. They then began orbiting over Cochrane waiting to replace HS1 at cloud top. HS5 took over and started top seeding storm #2 for Airdrie at 0047Z (08/07). Then at 0141Z (08/07) they were out of ejectable flares, so they RTB. They landed at 0155Z (08/07).<br><br>HS3 was launched at 0059Z (08/07) to an intensifying and long-lived storm moving toward Airdrie. The aircraft became airborne at 0119Z (08/07) and expedited to the Airdrie storm (#2). Then at 0141Z (08/07) they replaced HS5 with top seeding and started seeding storm #2 for Airdrie and Beiseker. At 0152Z (08/07), the crew stopped seeding and repositioned to west of Rocky MH. HS3 began seeding storm #3 for Rocky MH at 0235Z (08/07). At 0340Z (08/07) they were out of ejectable flares, so HS3 stopped seeding and RTB. The flight landed at 0355Z (08/07).<br><br>HS2 was launched at 0139Z (08/07) to a tall storm near Airdrie. The flight was airborne at 0207Z (08/07) and was redirected to an intensifying thunderstorm west of Rocky MH. At 0243Z (08/07) they started base seeding storm #3 for Rocky MH. HS2 continued seeding the hail producing storm as it moved toward Rocky MH. Then at 0348Z (08/07) the storm was no longer a threat to the Rocky MH area, so they stopped seeding and repositioned to a new storm west-southwest of Sylvan. At 0407Z (08/07) HS2 started patrolling for Sylvan. HS2 then RTB at 0411Z (08/07). They landed at 0433Z (08/07).<br><br>HS1 was launched at 0218Z (08/07) to a line of thunderstorms beginning to push into the northern project area from the northwest. The aircraft became airborne at 0227Z (08/07) and climbed to the base seeding altitude. At 0252Z (08/07) HS1 started patrolling the Sylvan area. The crew climbed up to the top seeding altitude while patrolling the area. HS1 started top seeding storm #4 for Sylvan at 0354Z (08/07). At 0412Z (08/07) they stopped seeding and started patrolling the same area. HS2 began seeding storm #5 for Innisfail at 0459Z (08/07). They stopped seeding at 0524Z (08/07). HS1 RTB at 0547Z (08/07), and landed at 0606Z (08/07).<br><br>Flight Summary<br>HS1: 1648Z-1712Z; no seeding; PR flight; takeoff YBW, land EA3.<br>HS1: 2115Z (08/06)-0100Z (08/07); 293 EJ, 28 BIP; #1 Cremona, #2 Cremona to Airdrie; |

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| | | takeoff EA3, land YBW.<br>HS2: 2121Z (08/06)-0001Z (08/07); 238 minutes wing-tip generators, 14 BIP; #1 Cremona, #2 Cremona to Airdrie.<br>HS4: 2141Z (08/06)-2200Z (08/07); no seeding; maintenance flight.<br>HS4: 2318Z (08/06)-0228Z (08/07); 268 minutes wing-tip generators, 20 BIP; #2 Cremona to Beiseker.<br>HS5: 2356Z (08/06)-0201Z (08/07); 306 EJ, 9 BIP; #2 Airdrie.<br>HS3: 0110Z (08/07)-0359Z (08/07); 285 EJ, 17 BIP; #2 Airdrie to Beiseker, #3 Rocky MH.<br>HS2: 0157Z (08/07)-0437Z (08/07); 130 minutes wing-tip generators, 6 BIP; #3 Rocky MH, patrol Sylvan.<br>HS1: 0223Z (08/07)-0609Z (08/07); 152 EJ, 4 BIP; #4 Sylvan, #5 Innisfail. |
| August 7, Thursday | A 90 knot upper level jet streak looked to slide over the area during the afternoon. Westerly flow was expected at the mid and upper levels. 500mb temperatures looked to cool by around 1C during the daytime. Several lobes of moderately strong vorticity were expected to pass over the area throughout the forecast period. Warm moist air looked to be present during the day and night. Upslope conditions looked to occur. A quasi-stationary front was prognosticated to slowly slide southward over the area. Area 00Z soundings indicated that the atmosphere would be fairly unstable with strong speed shear.<br><br>Storms started initiating along the foothills in the early afternoon. The first storm (#1) of the period formed over the mountains and moved eastward through Rocky MH, Sylvan, and Red Deer. Radar data suggested that golf ball size hail may have fallen over western Red Deer. Storm #2 developed near the western boundary of the project area, northwest of Cochrane. This supercell quickly became organized and tracked eastward through Airdrie. Radar data indicated that golf ball size hail may have fallen in Airdrie which was confirmed with a hail report. In the late afternoon, another supercell (storm #3) formed west of Sundre and tracked through the town of Olds. The next storm (#4) developed near the town of Caroline and moved eastward through Innisfail. Another storm (#5) then developed and tracked eastward through Penhold. The sixth storm of the day to be seeded formed near Limestone mountain and tracked toward the Sundre area. Storm #7 grew northwest of Cremona and slid southeastward through Cremona and Airdrie. This supercell stayed just to the north of Strathmore as it tracked eastward. The last seeded storm (#8) of the day formed northwest of Cochrane and moved eastward through Cochrane and Calgary. Radar data suggested that grape size hail may have fallen over northern Calgary. Scattered elevated thunderstorms were then observed over the area during the nighttime hours. The overnight thunderstorms produced convective rain showers. | HS4 was launched to the west of Rocky MH at 1935Z. The aircraft became airborne at 2000Z. At 2125Z HS4 started patrolling west of Rocky MH reporting very low cloud bases. As the storm moved off the hills, the crew then reported finding more consistent inflow, so HS4 started base seeding storm #1 for Rocky MH at 2049Z. At 2144Z HS4 stopped seeding and RTB. They landed at 2140Z.<br><br>HS5 was launched to a growing TITAN cell west of Cochrane at 2034Z. The flight was airborne at 2056Z. HS5 started top seeding storm #2 for Airdrie at 2112Z. The crew seeded the storm as it moved toward Airdrie. Then at 2224Z, HS5 was out of ejectable flares, so they RTB. They landed at 2236Z.<br><br>HS2 was launched at 2036Z to a growing storm west of Cochrane. They were airborne at 2054Z. Upon arriving at the thunderstorm, HS2 started base seeding storm #2 for Airdrie at 2102Z. They continued seeding the storm as it moved toward Airdrie. Then at 2232Z they stopped seeding and repositioned to another strong storm near Sundre. HS2 started seeding storm #3 for Olds at 2245Z. Next they stopped seeding and repositioned to another thunderstorm near Caroline at 2257Z. HS2 started seeding storm #4 for Innisfail at 2308Z. At 2354Z they were low on chemical and flares, so HS2 RTB. The aircraft landed at 0014Z (08/08).<br><br>HS1 was launched to a rapidly intensifying severe thunderstorm north of Cochrane at 2121Z. The aircraft became airborne at 2150Z. Upon reaching top seeding altitude, they orbited over the Turner Valley area. HS1 then repositioned to storm #2 in order to take over for HS5 top seeding. HS1 started top seeding |

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| | Golf ball size hail reported in Airdrie and Eckville. Two inch hail was measured in Red Deer. Pea size hail fell over northeastern Red Deer. For Red Deer, hail size was generally larger over the western part of the city. Toonie size hail fell 10 miles west of the Olds-Didsbury airport. Pea size hail fell at the Olds-Didsbury airport radar site twice during the daytime hours. Grape size hail fell west of the town of Olds. A gustnado was observed near Airdrie.<br><br>Max cell top: 14.4km, 71.7 max dBz, 184.9 max VIL<br><br>Tmax YC = 26.7C and 6.2mm of rain.<br>Tmax QF = 23.3C and 8.2mm of rain.<br>Tmax Radar = 22.7C and 20.3mm of rain. | storm #2 for Airdrie at 2224Z. Next they stopped seeding and repositioned to the Sundre area at 2234Z. At 2244Z, HS1 started seeding storm #3 for Olds. They then stopped seeding and repositioned to another storm near Caroline at 2303Z. HS1 started seeding storm #4 for Innisfail at 2308Z. At 2353Z, they had used up all of their ejectable flares, so they stopped seeding and RTB. The flight landed at 0011Z (08/08).<br><br>HS3 was launched at 2133Z to a long-lived strong storm north of Rocky MH. They were airborne at 2151Z. The crew started top seeding storm #1 for Sylvan at 2202Z. HS3 continued seeding the storm as it moved through Sylvan and Red Deer. At 2337Z, HS3 was out of ejectable seeding flares, so they stopped seeding and RTB. The flight landed at 2343Z.<br><br>HS4 was launched at 2200Z to an organized storm near Eckville. The aircraft was airborne out of YQF at 2217Z. HS4 quickly found inflow and started base seeding storm #1 at 2224Z for Sylvan. HS4 continued seeding the storm as it moved through Sylvan and approached Red Deer. Then at 2337Z, the storm was no longer a threat to Red Deer. They continued seeding with wing-tip generators as they repositioned to another strong storm west of Innisfail. HS4 then started seeding this storm (#4) for Innisfail starting at 2341Z. At 0008Z (08/08) the aircraft was running low on seeding material, so they stopped seeding and RTB. The flight landed in YBW at 0031Z (08/08).<br><br>HS3 was launched at 0018Z (08/08) to another strong and long-lived storm moving toward Red Deer. The aircraft was airborne out of YQF at 0036Z (08/08). HS3 started base seeding storm #5 for Penhold at 0041Z (08/08). At 0050Z (08/08) they seeded a line of storms while in transit as they repositioned to more vigorous growth northwest of Sundre. They climbed to cloud top. HS3 started top seeding storm #6 at 0107Z (08/08) for Sundre. They stopped seeding and RTB at 0138Z (08/08). The flight landed in YBW at 0200Z (08/08).<br><br>HS5 was launched to the northwest of Sundre at 0038Z (08/08). The flight became airborne at 0100Z (08/08). They started top seeding storm #7 for Cremona at 0110Z (08/08). The crew continued seeding the storm as it moved through Airdrie and toward Strathmore. Then at 0308Z (08/08), HS5 stopped seeding and RTB. They landed at 0321Z (08/08).<br><br>HS2 flew a maintenance flight. The aircraft |

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| | | was airborne at 0114Z (08/08) and landed at 0126Z (08/08). There was a problem with their transponder which forced them to RTB shortly after takeoff.<br><br>HS4 was launched to a supercell thunderstorm near Cremona at 0124Z (08/08). The flight became airborne out of YBW at 0142Z (08/08). The crew started base seeding storm #7 for Airdrie at 0153Z (08/08). With heavy air traffic over YYC, Calgary ATC started giving HS4 vectors and restricted seeding aircraft to a spot away from inflow at 0213Z (08/08). At 0219Z (08/08), HS4 continued to be far out of seeding position due to air traffic control vectors, so they stopped seeding and started patrolling for Strathmore. As the storm passed YYC, they then resumed seeding storm #7 for Strathmore at 0227Z (08/08). At 0313Z (08/08), HS4 stopped seeding and RTB. They landed in YQF at 0346Z (08/08).<br><br>HS3 flew a reposition flight. The flight was airborne out of YBW at 0313Z (08/08) and landed in YQF at 0337Z (08/08).<br><br>HS1 was launched at 0348Z (08/08) to a growing thunderstorm northwest of Cochrane. The aircraft became airborne at 0404Z (08/08). They began patrolling Cochrane at 0409Z (08/08). At 0429Z (08/08) they began top seeding storm #8 for Cochrane. The crew continued seeding the thunderstorm as it passed over Cochrane and then went through the Calgary area. HS1 stopped seeding and RTB at 0533Z (08/08) and landed at 0547Z (08/08).<br><br>Flight Summary<br>HS4: 1950Z-2146Z; 70 minutes wing-tip generators, 5 BIP; #1 Rocky MH.<br>HS5: 2045Z-2239Z; 297 EJ, 11 BIP; #2 Airdrie.<br>HS2: 2045Z (08/07)-0018Z (08/08); 284 minutes wing-tip generators, 24 BIP; #2 Airdrie, #3 Olds, #4 Innisfail.<br>HS1: 2142Z (08/07)-0013Z (08/08); 286 EJ, 15 BIP; #2 Airdrie, #3 Olds, #4 Innisfail.<br>HS3: 2142Z-2348Z; 305 EJ, 13 BIP; #1 Sylvan to Red Deer.<br>HS4: 2205Z (08/07)-0036Z (08/08); 208 minutes wing-tip generators, 20 BIP; #1 Sylvan to Red Deer; #4 Innisfail; takeoff YQF, land YBW.<br>HS3: 0033Z (08/08)-0203Z (08/08); 94 EJ, 12 BIP; #5 Penhold, #6 Sundre; takeoff YQF, land YBW.<br>HS5: 0048Z (08/08)-0325Z (08/08); 209 EJ, 20 BIP; #7 Cremona to Airdrie to Strathmore.<br>HS2: 0109Z (08/08)-0129Z (08/08); no seeding; maintenance flight, transponder problem. |

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| | | HS4: 0132Z (08/08)-0350Z (08/08); 142 minutes wing-tip generators, 10 BIP; #7 Airdrie to Strathmore; takeoff YBW, land YQF.<br>HS3: 0302Z (08/08)-0342Z (08/08); no seeding; reposition flight; takeoff YBW, land YQF.<br>HS1: 0358Z (08/08)-0549Z (08/08); 0 EJ, 13 BIP; #8 Cochrane to Calgary. |
| August 8, Friday | The right entrance region of a 105 knot upper level jet streak was expected to be directly over the region during the afternoon. A strong midlevel shortwave trough looked to move eastward over the area during the daytime. Strong PVA was expected along the leading edge of the trough. 500mb temperatures were expected to cool over the Calgary area by approximately 1C. Warm moist air looked to stay in place over the area through the afternoon. At the surface, a stationary front was positioned over the area. This stationary front was prognosticated to strengthen into a cold front and move southward. The 18Z CYYC modified model sounding was very unstable. The sounding suggested that long-lived strong thunderstorm were likely. Effective bulk shear values looked to be around 45 kts.<br><br>In the morning, a long line of thunderstorms moved into the northern project area near Sundre and pushed northeastward through the Red Deer area. In the early afternoon, cells started developing along the foothills west of Cremona, Calgary, and Turner Valley. Storm #1 moved eastward off the foothills through northern Calgary. This storm also moved through Strathmore. Another storm (#2) quickly formed over the foothills west of Turner Valley. The strengthening storm then tracked through the Okotoks area. The next storm (#3) developed southwest of Turner Valley and moved east-northeastward toward Okotoks and High River. This storm eventually merged with storm #2 near Okotoks. The southern end of this long line of thunderstorms intensified as it continued to move eastward over the southeastern part of the project area during late afternoon hours. Several weak thunderstorms then moved eastward over the southern half of the region during the evening. Overnight, the thunderstorm activity shifted east of the protected area.<br><br>Greater than golf ball size hail was reported 5 miles east of Okotoks. Toonie size hail was reported in the northwestern part of Calgary. Drifts of small hail fell in parts of Calgary and across the QE2 highway near the town of Balzac.<br><br>Max cell top: 15.1km, 69.3 max dBz, 185.2 max VIL<br><br>Tmax YC = 20.9C and 11.6mm of rain.<br>Tmax QF = 15.8C and 10.8mm of rain.<br>Tmax Radar = 15.7C and 4.6mm of rain. | HS4 flew a reposition flight. The aircraft was airborne out of YQF at 1541Z and landed in YBW at 1618Z.<br><br>HS2 flew a maintenance flight after service to the transponder. The aircraft was airborne at 1847Z and landed at 1854Z. The problem was fixed.<br><br>HS4 was launched to an intensifying thunderstorm west of Calgary at 1850Z. The flight was airborne out of YBW at 1902Z. At 1907Z, HS4 started patrolling west of Calgary. They then started base seeding storm #2 for Okotoks at 2104Z. At 2152Z HS4 stopped seeding and RTB. They landed in YQF at 2243Z.<br><br>HS5 was launched at 1857Z to a growing thunderstorm west of Calgary. The flight was airborne at 1912Z. At 1917Z, they started patrolling west of Calgary. HS5 started finding decent growth over YBW, so they started top seeding storm #1 for Calgary at 2037Z. The crew continued seeding the thunderstorm as it moved eastward into Calgary. HS5 then stopped seeding when they were replaced by HS1 at top. They RTB at 2141Z. They landed at 2149Z.<br><br>HS1 was launched at 2058Z to a tall and intensifying storm near Turner Valley. The aircraft was airborne at 2110Z. They then started top seeding storm #3 for High River at 2132Z. HS1 was finding marginal growth with minimal super-cooled liquid water along the storm, so they stopped seeding and repositioned to over the Calgary area at 2138Z. They then started seeding storm #1 for Calgary at 2147Z taking over for HS5. The crew continued seeding the storm as it moved eastward through Calgary toward Strathmore. At 2228Z, they stopped seeding and RTB. The aircraft landed at 2253Z.<br><br>Flight Summary<br>HS4: 1533Z-1620Z; no seeding; reposition flight; takeoff YQF, land YBW.<br>HS2: 1837Z-1859Z; no seeding; maintenance flight.<br>HS4: 1855Z-2246Z; 94 minutes wing-tip generators, 1 BIP; patrol Calgary, #2 Okotoks; |

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| | | takeoff YBW, land YQF.<br>HS5: 1904Z-2153Z; 87 EJ, 4 BIP; #1 Calgary.<br>HS1: 2106Z-2306Z; 105 EJ, 3 BIP; #3 High River, #1 Calgary to Strathmore. |
| August 9, Saturday | Upper level jet energy looked to stay north of the region throughout the forecast period. A midlevel high pressure ridge was expected to slowly build over the area during the day and night. A couple waves of weak PVA looked to push eastward across the area. At the surface, high pressure was prognosticated to stay over the southern half of AB through the evening. Area soundings indicated that the atmosphere would be mainly stable during the afternoon, evening, and overnight.<br><br>Cirrus, cirrostratus, and fair weather cumulus clouds were seen over the area throughout the period. No lightning strikes were observed.<br><br>No TITAN cells.<br><br>Tmax YC = 20.9C and no rain.<br>Tmax QF = 20.8C and no rain.<br>Tmax Radar = 19.4C and no rain. | No aircraft operations. |
| August 10, Sunday | An upper level jet was expected to depart the project area as a ridge moved in. A very strong cap was anticipated to develop over the project area, and prohibit convective develop. A weak area of vorticity would move through the northern project area overnight, but it was not expected to sustain significant convective development.<br><br>No significant meteorological echoes occurred. Skies were mostly clear across the project area. Lightning did not occur in the project area.<br><br>Tmax YC = 25.1C and no rain.<br>Tmax QF = 24.9C and no rain.<br>Tmax Radar = 23.8C and no rain. | No aircraft operations. |
| August 11, Monday | There was a strong ridge overhead, and it was expected to remain over the area through the forecast period. No significant vorticity advection was forecast. A modest cap was predicted to remain over the area. No other forcing mechanisms were expected, and convective development was not anticipated.<br><br>No significant meteorological echoes occurred. A few fair weather cumulus clouds were seen in the project area. Lightning did not occur in the project area.<br><br>Tmax YC = 28.5C and no rain.<br>Tmax QF = 27.5C and no rain.<br>Tmax Radar = 26.3C and no rain. | No aircraft operations. |
| August 12, Tuesday | An upper level ridge was expected to slowly move east away from the area. Two areas of vorticity advection were forecast to affect the area: one moving over the mountains and foothills during the evening, and another moving north through the project area overnight. A | No aircraft operations. |

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| | modest low level jet was expected to develop overnight. A strong daytime cap was anticipated over the project area, leaving the opportunity for convection confined to the areas of best vorticity forcing. Rain and thunderstorms were expected to move through the project area overnight.<br><br>Conditions were dry and mostly clear through the evening. At 05Z, scattered showers with embedded thundershowers began to develop in the southern project area, and gradually moved north through the region. Lightning was observed, but radar did not indicate that any hail fell in the project area.<br><br>Max cell top: 7.6km, 53.9 max dBz, 13.6 max VIL<br><br>Tmax YC = 30.0C and no rain.<br>Tmax QF = 28.8C and no rain.<br>Tmax Radar = 27.2C and no rain. | |
| August 13, Wednesday | A cut-off upper level low was located in the Pacific Northwest U.S., with a weak jet streak rounding its eastern side. No significant impulses of vorticity were expected. Instability was forecast to be high, with only a weak cap. Wind shear was weak, and no storm organization was expected. Weak lee cyclogenesis was anticipated to enhance upslope flow in the northern project area.<br><br>Very isolated convection initiated west of Calgary around 2230Z. Convection was disorganized, but slowly drifted east toward Calgary. Shortly after 00Z, a cell initiated over southern Calgary and became storm #1 before it weakened and left the city. Sporadic convection continued to develop west of Calgary and west of Red Deer through the late evening. Convection ceased around 6Z. There was lightning in the project area. Radar indicated grape size hail may have fallen in southern Calgary.<br><br>Max cell top: 10.6km, 65.1 max dBz, 62.1 max VIL<br><br>Tmax YC = 29.5C and 0.2mm of rain.<br>Tmax QF = 27.4C and no rain.<br>Tmax Radar = 26.4C and no rain. | HS5 was launched at 2241Z. They were airborne at 2302Z. HS5 began patrolling Calgary at 2307Z. They began top seeding storm #1 Calgary at 0024Z (08/14). HS5 stopped seeding and resumed their patrol of Calgary at 0054Z (08/14). HS5 RTB at 0117Z (08/14), and landed at 0128Z (08/14).<br><br>Flight Summary<br>HS5: 2252Z (08/13)-0132Z (08/14); 67 EJ, 0 BIP; #1 Calgary. |
| August 14, Thursday | A large cutoff upper level low remained over the Pacific Northwest U.S. Pulses of mid-level vorticity continued to orbit around this circulation, passing through the entire project area. A large mass of clouds was observed in southern Alberta which was expected to spread north during the day. Instability was forecast to be hindered by this cloud mass and ambient haze. Wind shear was poor, and storms were not expected to have consistent structure or organization. Showers were expected to continue overnight.<br><br>Convection initiated in the southern project area and buffer around 22Z, and continued to develop further north in the eastern buffer. Storm #1 formed in the project area | A radar tour was conducted at the Olds-Didsbury airport with 18 people in attendance.<br><br>HS2 flew a PR flight. They were airborne from YBW at 1700Z, and landed at EA3 at 1720Z.<br><br>HS2 was launched for convection moving west in the eastern buffer at 2321Z. They were airborne at 2336Z from EA3. HS2 began base seeding storm #1 Carstairs at 2350Z. At 2359Z they repositioned to the Irricana area, leaving burners on enroute. They began seeding storm #2 Irricana at 0008Z (08/15). HS2 stopped seeding and repositioned to Okotoks at 0056Z |

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| | east of Carstairs and moved west toward the city. It dissipated fairly quickly, and was overtaken by a new cluster of storms further east. Storm #2 was in this cluster of convection, which slowly moved west through the Beiseker and Irricana area. Storm #2 intensified and continued moving west toward Airdrie, but weakened slightly and expanded into a large disorganized thunderstorm cluster when it passed through town around 0130Z. Meanwhile, in the southern project area, a different storm initiated southeast of High River around 2330Z. It slowly tracked northwest, and became a small hail threat for Okotoks at 0030Z. This cell, storm #3, was seeded until it weakened significantly and no longer threated a project city. Weaker convection continued through the night across the central project area. However, no significant hail threats accompanied the thunderstorms. Lightning was observed in the project area. Radar indicated golf ball size hail may have occurred west of Acme. Radar also indicated up to grape size hail may have fallen in Okotoks.<br><br>Max cell top: 15.1km, 66.6 max dBz, 107.6 max VIL<br><br>Tmax YC = 23.5C and 1.6mm of rain.<br>Tmax QF = 28.8C and 13.6mm of rain.<br>Tmax Radar = 24.8C and 9.4mm of rain. | (08/15). ATC would not allow HS2 to operate in this desired area, so they returned to storm #2 Airdrie and resumed seeing at 0100Z (08/15). HS2 stopped seeding and RTB at 0133Z (08/15). They landed at YBW at 0159Z (08/15).<br><br>HS1 was launched at 0001Z (08/15). They were airborne at 0018Z (08/15). HS1 began top seeding storm #3 Okotoks at 0045Z (08/15). They stopped seeding but continued patrolling Calgary at 0059Z (08/15). HS1 RTB at 0135Z (08/15), and landed at 0147Z (08/15).<br><br>HS3 was launched at 0019Z (08/15). They were airborne at 0058Z (08/15). HS3 began top seeding at 0124Z (08/15) storm #2 Olds. They stopped seeding and RTB at 0151Z (08/15). HS3 landed at 0159Z (08/15).<br><br>Flight Summary<br>HS2: 1647Z-1722Z; PR flight; no seeding; takeoff YBW, land EA3.<br>HS2: 2330Z-0201Z; 206 minutes wing-tip generators, 0 BIP; #1 Carstairs, #2 Irricana to Carstairs-Crossfield-Airdrie; takeoff EA3, land YBW.<br>HS1: 0012Z-0149Z (08/15); 10 EJ, 2 BIP; #3 Okotoks, patrol Calgary.<br>HS3: 0052Z-0204Z (08/15); 47 EJ, 4 BIP; #2 Olds. |
| August 15, Friday | A cut-off upper level low was expected to weaken slightly as it drifted east near Spokane, WA. Modest pulses of vorticity advection were forecast to orbit this circulation through the forecast period, providing a significant threat of rain and thunderstorms. Instability was modeled to be modest, though wind shear was slightly stronger than previous days. Showers and thunderstorms were expected to continue overnight, though elevated instability was expected to taper after midnight.<br><br>Thundershowers developed in the southeast corner of the project area Friday morning but dissipated before threatening any major cities. New convection developed in the foothills and in the southeast project area around 20Z. Convection remained relatively weak and disorganized until new development occurred near Turner Valley at 2230Z. These thunderstorms slowly moved north and threatened Calgary. The complex became storm #1 at 2354Z. By 0030Z, the storm was in Calgary and weakening significantly, and attention turned to new development to the northwest near Cochrane. This would become storm #2 as it moved north-northwest by Cochrane before the cell weakened and moved away from town around 01Z. One final storm developed near Okotoks around 0030Z, but it dissipated and moved too far east to threaten Calgary. All activity ceased from 02-06Z, but weak rain showers redeveloped in the southern project area after midnight. Lightning did occur in the project area. Radar indicated golf ball size hail may have | HS5 was launched at 2255Z for convection threatening Calgary. They were airborne at 2305Z. HS5 began top seeding storm #1 Calgary at 2316Z. HS5 stopped seeding and repositioned to the Cochrane area at 0020Z (08/16). HS5 began seeding storm #2 Cochrane at 0027Z (08/16). HS5 stopped seeding and RTB at 0102Z (08/16). They landed at 0113Z (08/16).<br><br>HS4 was launched at 2257Z for convection threatening Calgary. They were airborne at 2318Z. HS4 began base seeding storm #1 Calgary at 2354Z. HS4 repositioned to Cochrane at 0016Z (08/16) and continued seeding in transit. HS4 stopped seeding and RTB at 0024Z (08/16). They landed at 0049Z (08/16).<br><br>HS1 was launched at 0100Z (08/16) for convection near High River. They were airborne at 0116Z (08/16). HS1 began patrolling Calgary at 0132Z (08/16). HS1 RTB at 0159Z (08/16). They landed at 0210Z (08/16).<br><br>Flight Summary<br>HS5: 2258Z (08/15)-0116Z (08/16); 199 EJ, 11 BIP; #1 Calgary, #2 Cochrane. |

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| | fallen a few miles southwest of Calgary; up to grape size hail may have fallen in the southwest corner of the city.<br><br>Max cell top: 12.1km, 66.6 max dBz, 106.0 max VIL<br><br>Tmax YC = 24.7C and no rain.<br>Tmax QF = 25.1C and 0.8mm of rain.<br>Tmax Radar = 23.1C and 3.8mm of rain. | HS4: 2305Z (08/15)-0058Z (08/16); 60 minutes wing-tip generators, 1 BIP; #1 Calgary.<br>HS1: 0111Z (08/16)-0212Z (08/16); no seeding; patrol Calgary. |
| August 16, Saturday | An upper level low was observed moving east into southern Alberta, and it was forecast to reach Saskatchewan by late evening. Mid-level pulses of vorticity were expected to orbit this circulation and provide convective initiation in the project area. Clouds were observed across much of the project area. However, some clearing was expected, and storms with significant hail were anticipated in these areas. Warming aloft was forecast to occur in the evening, and only weakening rain showers were expected in the overnight hours.<br><br>In the late afternoon, a line of thunderstorms began pushing eastward off the foothills into the northern part of the project area. Storm #1 formed in the northern buffer zone and tracked through the Rocky MH area. The second seeded thunderstorm (storm #2) of the period formed west of Cremona and moved southeastward through Cochrane, southwestern Calgary, and Okotoks. Lightning did occur in the project area. Radar indicated up to golf ball size hail may have fallen north of Rocky Mountain House in the buffer zone, and up to grape size hail may have fallen in southern Calgary.<br><br>Max cell top: 12.9km, 67.7 max dBz, 100.3 max VIL<br><br>Tmax YC = 21.6C and a trace of rain.<br>Tmax QF = 20.7C and 4mm of rain.<br>Tmax Radar = 19.9C and 3.6mm of rain. | HS5 was launched at 2239Z to a line of TITAN cells northwest of Rocky MH. The aircraft became airborne at 2257Z. They started top seeding storm #1 for Rocky MH at 2329Z. Then at 2356Z, the thunderstorm was no longer a threat to Rocky MH, so they stopped seeding and repositioned to northwest of the Cochrane area. HS5 started patrolling for Cochrane at 0014Z (08/17). At 0023Z (08/17), they started seeding storm #2 for Cochrane. Then at 0042Z (08/17) the storm was gradually continuing to weaken, so HS5 stopped seeding and started patrolling for Calgary. At 0155Z (08/17) the thunderstorm started intensifying, so they resumed seeding storm #2 for Calgary. HS5 continued seeding the storm as it moved toward Okotoks. At 0207Z (08/17) the crew stopped seeding and began patrolling the same area for High River. The cluster of TITAN cells continued to diminish, so they RTB at 0211Z (08/17). The flight landed at 0220Z (08/17).<br><br>Flight Summary<br>HS5: 2251Z (08/16)-0222Z (08/17); 38 EJ, 4 BIP; #1 Rocky MH, #2 Cochrane to Calgary to Okotoks; patrol High River. |
| August 17, Sunday | Upper level jet energy looked to stay well north and west of the region. At the mid-levels, a weak shortwave trough was expected to slide southeastward across the area during the afternoon and evening. Weak PVA looked to occur with the shortwave trough. Winds were expected to be out of the north to northwest throughout the troposphere. Area 00Z modified model soundings indicated that the troposphere would be fairly unstable, but speed shear looked to be very weak.<br><br>Isolated thunderstorms formed over the area during the morning hours. Radar data indicated that grape size hail may have fallen east of Beiseker in the eastern buffer zone. A few isolated convective rain showers were then observed in the early afternoon. The rest of the daytime hours saw fair weather cumulus clouds. Overnight skies were mostly clear over the region.<br><br>Max cell top: 6.9km, 62.9 max dBz, 44.7 max VIL<br><br>Tmax YC = 23.5C and no rain.<br>Tmax QF = 24.1C and no rain. | No aircraft operations. |

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| | Tmax Radar = 21.6C and no rain. | |
| August 18, Monday | The upper level jet was expected to shift southeastward over the area during the overnight hours. A small ridge that was initially over southern AB looked to flatten during the afternoon hours. Mainly zonal flow was then expected for the rest of the period. A few waves of moderately strong PVA looked to push into the area in the evening and overnight. A surface trough was prognosticated to begin sliding southeastward into the region during the nighttime hours. The 00Z and 06Z modified model soundings suggested that the atmosphere would be moderately unstable with very weak speed shear. A modest cap looked to keep convection suppressed through the afternoon.<br><br>Convection started developing along the foothills west of Rocky MH during the late afternoon. This convection then pushed into the protected area at around 00Z. Isolated thunderstorms and convective rain showers were then observed for the rest of the evening and overnight over the northern half of the project area. Radar data showed that pea size hail may have fallen southwest of Red Deer.<br><br>Max cell top: 7.6km, 60.7 max dBz, 29.1 max VIL<br><br>Tmax YC = 28.0C and no rain.<br>Tmax QF = 27.5C and no rain.<br>Tmax Radar = 25.5C and no rain. | No aircraft operations. |
| August 19, Tuesday | The right entrance region of an upper level jet streak was expected to stay directly over the area. A mid and upper level trough looked to deepen and intensify over most of AB. Two waves of moderately strong PVA were expected. The first wave looked to move eastward across the area in the afternoon, and the second wave of vorticity was expected to push through overnight. 500mb temperatures were expected to cool by at least 3C throughout the period. The low levels and surface looked to stay moist. Area modified model soundings showed that the troposphere would be fairly unstable with around 30 knots of effective bulk shear.<br><br>In the morning, a weak thunderstorm developed near the town of Lacombe. Thunderstorms formed along the foothills west of Rocky MH and Calgary in the early afternoon. These thunderstorms gradually became more organized as they moved off the foothills. Storm #1 developed southwest of Calgary and tracked eastward through southern Calgary, Okotoks, and High River. This storm became larger as it moved eastward across the southern project area. Radar data indicated that golf ball size hail may have fallen south and southeast of Calgary from this thunderstorm. The cluster of thunderstorms (storm #2) that formed west of Rocky MH slowly tracked southeastward into the protected area. This cluster of convective cells eventually morphed into a line of strong thunderstorms which tracked southeastward over most of the project area in the late afternoon and early evening. | HS5 was launched at 1950Z to a storm pushing off the foothills southwest of Calgary. The aircraft became airborne at 2005Z. At 2017Z, HS5 started patrolling for Calgary. HS5 then reported rapid growth and good visual targets along the storm (#1), so they started top seeding for Calgary at 2037Z. The crew continued seeding the thunderstorm as it moved toward southern Calgary and Okotoks. At 2140Z they descended in order to shed ice. Then at 2153Z HS5 resumed top seeding storm #1 for High River. At 2237Z, the storm was diminishing, so they stopped seeding and started patrolling the same area. Then at 2240Z HS5 RTB. They landed at 2256Z.<br><br>HS2 was launched at 2053Z to a pulse thunderstorm southwest of Calgary. The flight was airborne at 2108Z. HS2 started base seeding at 2122Z for Turner Valley and High River. They continued seeding the storm as it tracked eastward through Turner Valley and toward High River. At 2226Z, HS2 stopped seeding and RTB. They landed at 2247Z.<br><br>HS4 was launched to a growing storm northwest of Caroline at 2108Z. The aircraft was airborne at 2124Z. At 2140Z, they started base seeding storm #2 for Caroline. The crew |

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| | According to radar data, pea size hail may have fallen over the far northern part of the Calgary from storm #2. The region then saw elevated thunderstorms in the late evening and overnight.<br><br>Max cell top: 13.6km, 69.2 max dBz, 147.3 max VIL<br><br>Tmax YC = 21.9C and a trace of rain.<br>Tmax QF = 21.7C and a trace of rain.<br>Tmax Radar = 20.5C and 6.1mm of rain. | continued seeding the storm as it moved through Caroline toward Bowden. At 2320Z, the storm was moving east of the QE2 highway, so HS4 stopped seeding and RTB. The flight landed at 2327Z.<br><br>HS3 was launched at 2218Z to a large and long-lived thunderstorm north of Sundre. The flight became airborne at 2236Z. HS3 started top seeding storm #2 for Bowden at 2245Z. At 2316Z, the storm was beginning to move east of the QE2 highway, so they stopped seeding and descended to shed ice. At this same time, the flight began patrolling. HS3 then started climbing back up to the top seeding altitude at 2331Z as they repositioned to near the Cochrane area. At 0031Z (08/20) the crew reported that the line of thunderstorms was glaciated and contained minimal growth, so they stopped seeding and RTB. They landed at 0050Z (08/20).<br><br>HS1 was launched at 0017Z (08/20) to a line of thunderstorms northwest of Cochrane and Calgary. The aircraft became airborne at 0043Z (08/20) and repositioned to the Strathmore area. HS1 started patrolling for Strathmore at 0100Z (08/20). The crew then reported that the line of thunderstorms was intensifying, so they started top seeding storm #2 for Strathmore at 0134Z (08/20). The storm was diminishing at 0207Z (08/20), so HS1 stopped seeding and RTB. The flight landed at 0232Z (08/20).<br><br>Flight Summary<br>HS5: 1958Z-2300Z; 175 EJ, 5 BIP; #1 Calgary, Okotoks, and High River.<br>HS2: 2101Z-2252Z; 128 minutes wing-tip generators, 11 BIP; #1 Turner Valley and High River.<br>HS4: 2116Z-2330Z; 200 minutes wing-tip generators, 9 BIP; #2 Caroline, Sundre, and Bowden.<br>HS3: 2230Z (08/19)-0055Z (08/20); 148 EJ, 8 BIP; #2 Bowden, patrol Cochrane.<br>HS1: 0035Z (08/20)-0235Z (08/20); 170 EJ, 3 BIP; #2 Strathmore. |
| August 20, Wednesday | An upper level jet streak was expected to extend from roughly the Edmonton area to Hudson Bay. The mid and upper level trough axis looked to stay over AB through the daytime hours. Overnight, this trough was expected to start quickly moving northeastward toward the Nunavut territory. PVA looked to occur throughout the period. Upslope conditions were prognosticated to occur at the surface and within the boundary layer. Area soundings indicated that CAPE values would be around 300 J/kg with around 25 knots of effective bulk shear. | No aircraft operations. |

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| | Scattered convective rain showers fell over the area in the morning. Another wave of convective rain showers then slowly pushed northeastward across the region in the afternoon and evening. Isolated, embedded weak thunderstorms were observed in the morning, afternoon, and evening. Radar data suggested that pea size hail may have fallen west of Three Hills. Overnight, scattered convective rain showers fell over the region.<br><br>Max cell top: 6.9km, 61.2 max dBz, 24.3 max VIL<br><br>Tmax YC = 14.5C and 13.1mm of rain.<br>Tmax QF = 18.3C and 2.2mm of rain.<br>Tmax Radar = 14.5C and 2.3mm of rain. | |
| August 21, Thursday | The upper level jet stream looked to stay just to the southeast of the region. Mid and upper level charts showed that an intensifying shortwave trough would dig southeastward along the coast of BC. Weak PVA was expected throughout the forecast period. The low levels and surface looked to see upslope conditions throughout the day and night. The 00Z Calgary modified model sounding suggested that the atmosphere would be slightly unstable.<br><br>Scattered convective rain showers fell over the protected area throughout the day and night. The southern half of the project area saw slightly more precipitation. No lightning strikes were observed.<br><br>Max cell top: 4.6km, 56.1 max dBz, 6.5 max VIL<br><br>Tmax YC = 12.9C and 0.2mm of rain.<br>Tmax QF = 16.1C and no rain.<br>Tmax Radar = 12.9C and no rain. | No aircraft operations. |
| August 22, Friday | Upper level jet energy looked to stay southeast of the area. The open wave low pressure system over Washington was expected to intensify into a closed low as it tracked eastward. Moderate PVA looked to occur throughout the period. Low level and surface winds were expected to favor upslope flow. The 00Z Calgary modified model sounding showed that the atmosphere would be only slightly unstable.<br><br>Scattered convective rain showers fell over the region through the evening. Stratiform cloud cover with isolated areas of virga and light rain showers were then observed over the area during the overnight. No lightning strikes were observed.<br><br>Max cell top: 3.9km, 51.1 max dBz, 4.5 max VIL<br><br>Tmax YC = 12.2C and 2.3mm of rain.<br>Tmax QF = 15.8C and a trace of rain.<br>Tmax Radar = 12.2C and 0.8mm of rain. | A radar tour was conducted at the Olds-Didsbury airport with 18 people in attendance.<br><br>CBC Calgary news and the Rocky MH Mountaineer newspaper interviewed Terry Krauss, Daniel Gilbert, and Jody Fischer.<br><br>HS3 flew a PR flight. The aircraft was airborne out of YQF at 1726Z and landed in EA3 at 1740Z.<br><br>HS3 flew a return PR flight. The flight was airborne out of EA3 at 2229Z and landed in YQF at 2244Z.<br><br>Flight Summary<br>HS3: 1722Z-1743Z; no seeding; PR flight; takeoff YQF, land EA3.<br>HS3: 2224Z-2249Z; no seeding; PR flight; takeoff EA3, land YQF. |
| August 23, Saturday | A weak portion of the upper level jet stream was expected to be directly over the area. The closed mid and upper level low that was over Idaho looked to start moving | No aircraft operations. |

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| | northeastward across Montana. Vorticity advection was expected to be weak over the area. Upslope conditions looked likely during the daytime. The 00Z modified model sounding indicated that the troposphere would be only slightly unstable with a strong low level cap.<br><br>Scattered light convective rain showers fell near Calgary and Strathmore during the afternoon hours. The rest of the region saw only fair weather cumulus during the daytime. Low level stratus and fog then developed over parts of the project area during the overnight hours.<br><br>No TITAN cells. 42.2 max dBz, 3.6 max VIL<br><br>Tmax YC = 14.1 C and no rain.<br>Tmax QF = 17.1 C and no rain.<br>Tmax Radar = 14.8 C and no rain. | |
| August 24, Sunday | Upper-level jet energy was west and south of the area, and was expected to remain there as the region remained under a trough. A weak area of mid-level vorticity was forecast to advect through the northern part of the project area overnight. Instability was expected to remain unimpressive, with a significant cap aloft.<br><br>Weak convective showers occurred in the eastern project area near Three Hills during the morning hours. There were no hail threats or lightning strikes. Fair weather cumulus was present during the afternoon. Fog developed overnight.<br><br>Max cell top: 4.6 km, 56.2 max dBz, 10.2 max VIL<br><br>Tmax YC = 16.8C and no rain.<br>Tmax QF = 18.2C and no rain.<br>Tmax Radar = 16.7C and no rain. | No aircraft operations. |
| August 25, Monday | A northerly upper level jet was expected to gradually drift eastward over the project area. Model soundings indicated only very weak shallow instability below 20 kft. A potent ribbon of vorticity would be pushing through the entire project area during the late afternoon. This was expected to create light shallow convective showers without lightning. Ridging was likely after 03Z. Clear conditions were likely during the evening and overnight.<br><br>Weak shallow convective rain showers pushed slowly through the project area between 22Z and 04Z. No lightning occurred. Precipitation ended in the late evening. There was no precipitation overnight.<br><br>Max cell top: 6.1 km, 57.8max dBz, 16.0max VIL<br><br>Tmax YC = 22.5C and no rain.<br>Tmax QF = 22.4C and no rain.<br>Tmax Radar = 21.3C and 0.5mm of rain. | No aircraft operations. |
| August 26, Tuesday | The upper level jet was positioned well north of the project area. A broad low amplitude ridge was well-established over the region. The mid and upper levels | No aircraft operations. |

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| | were warm, and the atmosphere was completely stable. No significant weather was forecast.<br><br>Skies were mostly clear during the afternoon and evening. Weak echoes passed through during the late night hours. They were mainly virga.<br><br>No TITAN cells, 37.1max dBz<br><br>Tmax YC = 25.6C and no rain.<br>Tmax QF = 25.8C and no rain.<br>Tmax Radar = 24.5C and no rain. | |
| August 27, Wednesday | Jet level winds were around 60 knots, providing wind shear over the area. A moderate amount of instability was likely during the afternoon, but there were no evident triggers to initiate convection during the day. A stalled cold front would be draped along the northern project border during the evening. A lee cyclone would be forming north of Red Deer in the late evening hours. Thunderstorms were possible over the far northern project area from late afternoon through the late night hours. Rain was expected the next morning as the front would eventually push southeast into the project area.<br><br>The first thunderstorm of the day moved southeastward through the northeastern part of the northern buffer zone in the late afternoon, passing through Ponoka. Storm #1 formed along the foothills well northwest of Rocky MH in the early evening. This storm then quickly tracked southeastward through the town of Lacombe. The project area cleared out overnight, and then a frontal rain band pushed south into the area during the early morning.<br><br>Max cell top:12.9 km, 67.6 max dBz, 109.5 max VIL<br><br>Tmax YC = 28.0C and no rain.<br>Tmax QF = 28.4C and no rain.<br>Tmax Radar = 26.2C and no rain. | HS3 was launched to a long-lived storm near Rimbey at 0200Z (08/28). The flight was airborne at 0212Z (08/28). HS3 started top seeding storm #1 for Lacombe at 0229Z (08/28). At 0236Z (08/28) they stopped seeding and RTB. The aircraft landed at 0245Z (08/28).<br><br>HS4 was launched at 0200Z (08/28) to a tall and organized storm near Rimbey. The aircraft became airborne at 0214Z (08/28). At 0224Z (08/28) they started base seeding storm #1 for Lacombe. HS4 then stopped seeding and RTB at 0234Z (08/28). The flight landed at 0245Z (08/28).<br><br>Flight Summary<br>HS3: 0206Z (08/28)-0250Z (08/08); 40 EJ, 2 BIP; #1 Lacombe.<br>HS4: 0206Z (08/28)-0252Z (08/08); 20 minutes wing-tip generators, 2 BIP; #1 Lacombe. |
| August 28, Thursday | An 80 knot upper level jet was in place. A cold front was draped across the project area at forecast time, expected to slowly push southward through the morning and afternoon. The project area was mainly stable with the exception of some very weak CAPE along the southern buffer zone. Stratus rain was forecast for the afternoon with a few lightning strikes possible in the far southern project area. There was not a significant threat for damaging hail.<br><br>Widespread rain persisted through the morning and afternoon. A few week TITAN cells were observed near High River, and some lightning was observed. There were no hail threats.<br><br>Max cell top: 7.6 km, 58.5 max dBz, 17.6 max VIL<br><br>Tmax YC =14.4C and 6.8 mm of rain.<br>Tmax QF = 16.3C and 6.2 mm of rain.<br>Tmax Radar = 13.8C and 8.6 mm of rain. | A radar tour was conducted during the afternoon. There were 16 people in attendance.<br><br>HS4 flew a PR flight from YQF to EA3. They were airborne at 1708Z. They landed at 1726Z.<br><br>HS4 flew a PR flight from EA3 to YQF. They were airborne at 2210Z. They landed at 2224Z.<br><br>Flight Summary<br>HS4: 1700Z-1728Z; no seeding; PR flight; takeoff YQF, land EA3.<br>HS4: 2204Z-2227Z; no seeding; PR flight; takeoff EA3, land YQF. |

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| August 29, Friday | A 60 knot upper jet was positioned over AB providing ample wind shear for organized cells. The atmosphere was expected to be slightly unstable during the late afternoon and evening. A shortwave ridge was in place early in the period, but it was expected to shift off to the east as a trough pushed into AB during the evening and overnight hours. A surface low was developing to the NW, and a cold front would push eastward through the project area between 00z and 06Z. Gusty SSE surface winds were forecast to kick off foothills convection during the afternoon. Organized, low topped convection was forecast to push through the project area during the evening. The atmosphere was expected to rapidly stabilize after 06Z. Dry conditions were likely overnight.<br><br>Chinook arch clouds overspread the project area during the afternoon. Around 01Z, a band of embedded frontal convection pushed eastward through the central part of the project area. Echoes indicated some areas with marginal hail threats, but only briefly. The front moved off to the east around 04Z, and then the project area rapidly stabilized behind the front. There were no significant echoes overnight.<br><br>Max cell top:11.4 km, 62.3 max dBz, 44.4 max VIL<br><br>Tmax YC = 21.7C and no rain.<br>Tmax QF = 20.1C and 3.8 mm of rain.<br>Tmax Radar = 19C and 4 mm of rain. | HS3 was launched at 0140Z (08/30). The aircraft became airborne at 0205Z (08/30). They then started patrolling for Innisfail starting at 0214Z (08/30). HS3 stopped patrolling and RTB at 0252Z (08/30). The flight landed at 0305Z (08/30).<br><br>Flight Summary<br>HS3: 0156Z (08/30)-0312Z (08/30); no seeding; patrol Innisfail. |
| August 30, Saturday | A moderate amount of afternoon and evening instability was likely with CAPE values near 800J/Kg. There was moderate speed shear, but poor directional shear. The atmosphere was cooling aloft. The -10C level would be as low as 13.8 kft. Surface dew points were expected to be relatively low, around 6C. Weak vorticity was expected during the afternoon and evening. Shallow, weak instability was expected to linger through the late night hours. Hail was forecast for the afternoon and evening, and then only convective showers were expected after midnight.<br><br>Storm #1 developed west of Caroline and moved southeastward through Bowden and Olds. This storm then continued moving across the eastern project area. Dime size hail was reported near Olds. Radar data indicated that golf ball size hail may have fallen to the southwest of Caroline. Another storm (#2) then formed west of Sundre. This thunderstorm became more organized as it tracked eastward through Sundre and toward Olds. Pea size hail was reported just the northwest of Sundre. The next seeded storm (#3) of the day developed over the foothills west of Rocky MH. This storm also had an east-southeastward trajectory as it moved through Rocky MH. The storm then diminished before it reached Sylvan and Red Deer.<br><br>Max cell top: 11.4km, 67.3 max dBz, 123.1 max VIL | HS5 was launched for patrol west of Calgary at 2057Z. The flight was airborne at 2109Z. At 2115Z HS5 started patrolling for Calgary. They were then redirected to stronger convection north of Sundre at 2134Z. HS5 then started top seeding storm #1 for Bowden and Olds at 2155Z. They then stopped seeding and descended to shed ice while enroute to a growing storm near Sundre at 2248Z. HS5 started top seeding storm #2 for Sundre at 2313Z. The crew continued seeding the storm as it moved toward the town of Olds. At 0016Z (08/31) the TITAN cell was diminishing, so they stopped seeding and RTB. The aircraft landed at 0032Z (08/31).<br><br>HS4 was launched at 2100Z to a long-lived storm west of Innisfail. The aircraft became airborne at 2118Z. They started base seeding storm #1 for Bowden and Olds at 2131Z. Then at 2254Z the storm was beginning to move over the QE2 highway, so they stopped seeding and RTB. The flight landed at 2306Z.<br><br>HS2 was launched to an intensifying thunderstorm near Sundre at 2322Z. The flight was airborne at 2335Z. Upon reaching the thunderstorm (storm #2), HS2 quickly found inflow and started base seeding for Olds at |

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| | Tmax YC = 19.9C and 0.8mm of rain.<br>Tmax QF = 19.8C and 0.6mm of rain.<br>Tmax Radar = 18.3C and no rain. | 2350Z. They then stopped seeding at 0009Z (08/31) and repositioned to a growing thunderstorm west of Rocky MH. HS2 started seeding storm #3 for Rocky MH at 0028Z (08/31). At 0105Z (08/31) they stopped seeding and RTB. The aircraft landed at 0131Z (08/31).<br><br>HS1 was launched in order to patrol the Calgary area at 2332Z. The aircraft became airborne at 2346Z. At 2359Z HS1 started patrolling the Calgary area. Then at 0017Z (08/31) they RTB. They landed at 0023Z (08/31).<br><br>HS3 was launched at 0003Z (08/31) to growing convection west of Rocky MH. The flight was airborne at 0019Z (08/31). At 0038Z (08/31) HS3 started top seeding storm #3 for Rocky MH. The crew continued seeding the storm as it moved toward Rocky MH. At 0103Z (08/31) HS3 stopped seeding and RTB. They landed at 0115Z (08/31).<br><br>Flight Summary<br>HS5: 2101Z (08/30)-0034Z (08/31); 269 EJ, 8 BIP; patrol Calgary, #1 Bowden and Olds, #2 Sundre to Olds.<br>HS4: 2107Z-2309Z; 166 minutes wing-tip generators, 10 BIP; #1 Bowden and Olds.<br>HS2: 2328Z (08/30)-0133Z (08/31); 140 minutes wing-tip generators, 7 BIP; #2 Olds, #3 Rocky MH.<br>HS1: 2338Z (08/30)-0026Z (08/31); no seeding; patrol Calgary.<br>HS3: 0012Z (08/31)-0120Z (08/31); 122 EJ, 7 BIP; #3 Rocky MH. |
| August 31, Sunday | Upper level jet energy looked to stay southwest of the area. A midlevel shortwave trough was expected to slowly move southeastward over AB during the afternoon and evening. Moderately strong PVA looked to be associated with the trough. Area soundings showed a moderately unstable air mass in place over the region. Effective bulk shear values suggested that long-lived thunderstorms were a possibility.<br><br>Scattered moderately strong thunderstorms formed over the entire region through around the time of sunset. None of these hail producing thunderstorms were a threat to any of the population centers located within the project area. Radar data indicated that grape size hail may have fallen northwest of the town Olds. Isolated convective rain showers then fell over the area during the nighttime hours.<br><br>Max cell top: 7.6km, 62.1 max dBz, 33.2 max VIL<br><br>Tmax YC = 19.4C and no rain.<br>Tmax QF = 19.4C and a trace of rain. | No aircraft operations. |

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| | | |
|---|---|---|
| | Tmax Radar = 16.8C and 2.3mm of rain. | |
| September 1, Monday | A northwesterly upper level jet was expected to be over central AB. Within the jet stream, a 110 knot jet streak looked to nose its way into the region during the afternoon. Winds at the mid-levels, low levels, and surface were expected to be mainly out of the west-northwest. Numerical guidance suggested that dew points would steadily rise in the northern part of the project area during the daytime. The 00Z soundings for Calgary and Red Deer showed that the troposphere would be moderately unstable. Effective bulk shear values indicated that long-lived thunderstorms were likely.<br><br>Several long-lived, weak to moderately strong thunderstorms began to push southeastward into the northern part of the protected area in the midafternoon. The thunderstorm activity then persisted into the early evening. Radar data indicated that grape size hail may have fallen to the northwest of Innisfail. Ice pellets and pea size hail were reported near Innisfail. Weaker thunderstorms were then observed during the early evening. Overnight, scattered convective rain showers fell over the region.<br><br>Max cell top: 8.4km, 63.8 max dBz, 38.5 max VIL<br><br>Tmax YC = 20.8C and no rain.<br>Tmax QF = 20.5C and 3.2mm of rain.<br>Tmax Radar = 19.8C and 1.0mm of rain. | No aircraft operations. |
| September 2, Tuesday | The upper level jet stream looked to stay directly over the region. An intensifying upper level trough was positioned over the Vancouver island area and was expected to begin sliding eastward along the international border. PVA was expected to be abundant due to the jet and trough. Weak lee cyclogenesis was prognosticated to occur during the afternoon hours. Calgary and Red Deer modified model soundings suggested that the atmosphere would be moderately unstable with around 45 kts of effective bulk shear. The 0 to 6 km bulk shear also looked to be around 45 kts.<br><br>Isolated convective rain showers occurred over the region in the morning. Scattered thunderstorms then formed directly over the area in the afternoon and evening. The strongest storm of the day formed east of Rimbey and tracked southeastward through the northern buffer zone. Radar data indicated that grape size hail may have fallen north and northwest of Lacombe. Widespread stratiform cloud cover with areas of embedded convective rain showers were observed over the southern half of the project area during the overnight hours.<br><br>Max cell top: 9.1km, 62.1 max dBz, 42.2 max VIL<br><br>Tmax YC = 14.5C and a trace of rain.<br>Tmax QF = 16.9C and 1.2mm of rain.<br>Tmax Radar = 15.1C and 0.3mm of rain. | No aircraft operations. |

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| | | |
|---|---|---|
| September 3, Wednesday | The upper level jet was expected to be southeast of the area. An open wave mid and upper level low looked to continue moving eastward along the international border. A wave of weak PVA was expected to move southeastward over the area. 500mb heights were expected to begin rising over central AB during the nighttime hours. Area modified model soundings indicated that CAPE values would be anywhere from 200 to 300 J/kg with no speed shear.<br><br>Light stratiform rain showers fell over the southern half of the project area in the morning. The afternoon and evening then saw scattered convective rain showers. Overnight, the cloud cover thinned and mostly clear skies occurred over parts of the area. No lightning strikes were observed.<br><br>Max cell top: 5.4km, 55.9 max dBz, 10.3 max VIL<br><br>Tmax YC = 12.0C and 2.2mm of rain.<br>Tmax QF = 15.7C and 1.2mm of rain.<br>Tmax Radar = 13.9C and 0.3mm of rain. | A radar tour was conducted at the Olds-Didsbury airport with 20 people in attendance.<br><br>HS5 flew a PR flight. The aircraft was airborne out of YBW at 1707Z and landed in EA3 at 1729Z.<br><br>HS5 then flew a return PR flight. The flight was airborne out of EA3 at 2236Z and landed in YBW at 2307Z.<br><br>Flight Summary<br>HS5: 1653Z-1730Z; no seeding; PR flight; takeoff YBW, land EA3.<br>HS5: 2227Z-2309Z; no seeding; PR flight; takeoff EA3, land YBW. |
| September 4, Thursday | An upper level jet streak looked to be over the region during the evening hours. A weak shortwave midlevel trough was expected to slide southeastward over the region during the afternoon and evening. PVA looked to be fairly weak with this disturbance. High pressure ridging was then expected to begin occurring during the overnight hours. Surface winds would be light and variable. Modified model soundings for the area suggested that moderate tropospheric instability was a possibility with around 15 kts of effective bulk shear.<br><br>Isolated to scattered, convective rain showers fell over the region in the afternoon and evening. Overnight, the skies gradually cleared over the area. No lightning strikes were observed.<br><br>Max cell top: 5.4km, 55.2 max dBz, 9.8 max VIL<br><br>Tmax YC = 18.2C and no rain.<br>Tmax QF = 19.3C and 0.8mm of rain.<br>Tmax Radar = 17.2C and 1.8mm of rain. | No aircraft operations. |
| September 5, Friday | Upper level jet energy was initially over central AB but was expected to shift northeastward throughout the period. A mid and upper level ridge looked to continue building over the southern half of AB through the early nighttime hours. A single wave of weak vorticity was expected to move southeastward across the region in the afternoon. Surface high pressure was prognosticated to be centered over central BC and southern SK during the daytime. Modified model sounding data indicated that the atmosphere would be stable.<br><br>Mostly clear skies were seen over the area through the afternoon. Weak stratiform echoes were observed east of Red Deer during the evening and early nighttime hours. These radar echoes likely only produced virga. | No aircraft operations. |

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|---|---|---|
| | No TITAN cells.<br><br>37.0 max dBz<br><br>Tmax YC = 23.3C and no rain.<br>Tmax QF = 22.2C and no rain.<br>Tmax Radar = 21.7C and no rain. | |
| September 6, Saturday | Upper level jet energy was expected to stay north of the protected area throughout the forecast period. The mid and upper level ridge looked to quickly flatten, and zonal flow was likely beginning during the evening hours. A few waves of weak vorticity were projected to pass over the region during the daytime hours. At the surface, a lee trough was expected to form over the region during the afternoon and remain over the area the rest of the period. The modified model soundings showed around 100 J/kg of CAPE. This instability was expected to be very elevated due to a strong low level cap in place over the region.<br><br>Skies were mostly clear throughout the period. There were no radar echoes.<br><br>No TITAN cells.<br><br>Tmax YC = 23.0C and no rain.<br>Tmax QF = 24.0C and no rain.<br>Tmax Radar = 23.9C and no rain. | No aircraft operations. |
| September 7, Sunday | Alberta had nearly zonal flow at the upper levels. A very powerful cold front was expected to push southward through the project area during the evening and overnight hours. An arctic air mass was expected to invade the region by morning. Afternoon instability would be significant with over 1000 J/Kg CAPE, and wind shear was excellent. A potent shortwave trough would be moving through the northern project area during the afternoon. Severe thunderstorms with large hail were possible over the northern project region.<br><br>Severe storms did not develop. Cold air moved into the region sooner than expected, so the atmosphere became only marginally unstable during the day. Weak cells developed, but the precipitation was only rain and/or very small hail. There were no damaging hail storms. Rain and snow flurries occurred overnight.<br><br>Max cell top:9.1 km, 59.4 max dBz, 19.4 max VIL<br><br>Tmax YC = 25.8C and no rain.<br>Tmax QF = 25.2C and 5.4 mm of mixed rain/snow.<br>Tmax Radar = 24.6C and 1 mm of mixed rain/snow | No aircraft operations. |
| September 8, Monday | An arctic air mass was flowing into the region bringing unseasonably cold temperatures. A broad trough was draped across Alberta. A northwesterly jet over BC would help the trough dig southward through the project region. Low level moisture was fair, but the atmosphere was completely stable precluding convection. Stratiform | No aircraft operations. |

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| | | |
|---|---|---|
| | rain/snow was expected off and on throughout the period.<br><br>Light rain and snow flurries occurred during the day. Heavy snow fell overnight with some moderate accumulation over the entire project area. There were no convective storms.<br><br>Max cell top:4.6 km, 52.5 max dBz, 6.1 max VIL<br><br>Tmax YC = 10.6C and 26.5 mm of snow/rain mix.<br>Tmax QF = 7.9C and 8.6 mm of snow/rain mix.<br>Tmax Radar = 10.2C and 15.2 mm of snow/rain mix. | |
| September 9, Tuesday | An unseasonably cold air mass remained in place over Alberta. A deep trough was draped across AB and SK. The trough was continuing to dig southward. A potent lobe of vorticity was expected to slide southeastward through the southern project region. Low level moisture remained in place, but the atmosphere was completely stable precluding any convective activity. Mixed rain and snow were likely throughout the period with up to 10cm of snow possible overnight.<br><br>Light rain/snow mixed precipitation occurred during the day. Heavy wet snow occurred overnight. Approximately 15-20 cm of snow occurred over the southern half of the project area after midnight. There was no convection.<br><br>Radar down for maintenance and calibration.<br><br>Tmax YC = 2.2C and 2.5mm of rain/snow mix.<br>Tmax QF = 3.3C and 5.8mm of rain/snow mix.<br>Tmax Radar = 3.0C and no precipitation data. | A radar tour was conducted at the Olds-Didsbury airport with 15 people in attendance.<br><br>Kim Weaver, a radar engineer from Advanced Radar Corp arrived to do radar maintenance and calibration through Friday. After calibration, the radar reflectivity values were approximately 3dBz weaker than what they had been throughout the season.<br><br>HS1 flew a PR flight. The aircraft was airborne out of YBW at 1752Z and landed in EA3 at 1813Z.<br><br>HS1 then flew a return PR flight. The flight was airborne out of EA3 at 2318Z and landed in YBW at 2344Z.<br><br>Flight Summary<br>HS1: 1741Z-1814Z; no seeding; PR flight; takeoff YBW, land EA3.<br>HS1: 2308Z-2347Z; no seeding; PR flight; takeoff EA3, land YBW. |
| September 10, Wednesday | The unseasonably cold air mass remained over the region. A deep trough was sliding southeastward out of the area during the afternoon. High pressure and ridging were expected to create clearing during the evening and overnight hours. Very cold overnight lows were forecast (-6C). Model soundings indicated some very weak, shallow CAPE in the low levels, but deep convection was not possible. No thunderstorms were expected.<br><br>Stratiform rain pushed southward through the region early in the day. Weak convective echoes were observed during the afternoon. There were no hail threats or lightning strikes.<br><br>Radar down for maintenance and calibration.<br><br>Tmax YC = 2.3C and 14.5 mm of rain/snow mix.<br>Tmax QF = 2.9C and 1.8 mm of rain/snow mix.<br>Tmax Radar = 4.6C, no precipitation data. | No aircraft operations. |
| September 11, Thursday | An upper level ridge was building into the region bringing high pressure. The atmosphere was absolutely stable making convection impossible. An extremely dry air | HS4 flew a maintenance flight. The aircraft was airborne at 0029Z (09/12) and landed at 0052Z (09/12). |

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| | mass was in place. Clear dry conditions were forecast for the entire period.<br><br>The project area was clear and dry throughout the period. There were no radar echoes.<br><br>Tmax YC = 7.4C and no rain.<br>Tmax QF = 10.6C and no rain.<br>Tmax Radar = 6.8C and no rain. | Flight Summary<br>HS4: 0017Z (09/12)-0100Z (09/12); no seeding; maintenance flight. |
| September 12, Friday | A weak upper level trough was pushing through the region. At the surface, a cold front was drifting southward through the project area during the day. There was very weak instability with CAPE values around 50 J/Kg. Cloudy, cool conditions were forecast for the period with light rain showers likely. A few isolated shallow convective echoes were anticipated. Deep convection was not possible.<br><br>Light stratus and convective rain showers persisted throughout the period. There were no lightning strikes or hail threats.<br><br>Max cell top: 3.1km, 55.0 max dBz, 2.3 max VIL<br><br>Tmax YC = 9.4C and 2.2 mm of rain.<br>Tmax QF = 9.6C and 2.8 mm of rain.<br>Tmax Radar = 7.8C, no precipitation data. | Kim Weaver from Advanced Radar Corp departed. |
| September 13, Saturday | A modest northerly jet was in place over Alberta. A high amplitude ridge was building in from the west. The atmosphere was nearly stable with only around 16 J/Kg of afternoon CAPE likely. A few early morning convective rain showers had already occurred at forecast time. Cloud cover was expected to diminish throughout the day. A few fair weather cumulus clouds were possible during the afternoon.<br><br>Isolated convective showers occurred during the early morning. Clouds gradually cleared out during the day. A few more shallow showers occurred overnight. There were no hail threats or lightning strikes.<br><br>No TITAN cells.<br><br>47.2 max dBz<br><br>Tmax YC = 12.5C and no rain.<br>Tmax QF = 13.0C and 1.2mm of rain.<br>Tmax Radar = 12.0C and no precipitation data. | No aircraft operations. |
| September 14, Sunday | A northerly upper level jet streak was expected to stay east of AB throughout the forecast period. Mid and upper level charts indicated that a large ridge would continue to build over AB throughout the day and night. PVA looked to be weak. Surface winds were prognosticated to be light and variable. Area soundings showed a shallow layer of weak instability extending from 8 to 12kft MSL. Above 12kft MSL, warm air looked to be present which inhibited deep convection. | No aircraft operations. |

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| | Scattered, light convective rain showers fell over the western half of the protected area during the morning hours. Fair weather cumulus clouds were then seen over the region in the afternoon and evening. Overnight, the skies became mostly clear. No TITAN cells and no lightning strikes.<br><br>45.9 max dBz<br><br>Tmax YC = 17.6C and no rain.<br>Tmax QF = 19.2C and no rain.<br>Tmax Radar = 17.8C and no precipitation data. | |
| September 15, Monday | Upper level jet energy looked to stay well to the northeast of the region. A ridge of high pressure was expected to stay in place over western Canada throughout the forecast period. A wave of weak PVA looked to move eastward across the region during the overnight hours. Surface winds looked to be light and variable. Area modified model soundings showed that the atmosphere would be mostly stable with a strong low level cap.<br><br>Mostly clear skies were observed over the area during the day and night.<br><br>No TITAN cells.<br><br>Tmax YC = 22.6C and no rain.<br>Tmax QF = 23.6C and no rain. | No aircraft operations. |

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# APPENDIX C – Aircraft Operations Summary Table

Air Time

| | HS1 | HS2 | HS3 | HS4 | HS5 |
|---|---|---|---|---|---|
| **JUNE** | 14:55 | 11:00 | 6:20 | 9:43 | 14:44 |
| **JULY** | 24:50 | 20:14 | 11:24 | 20:32 | 19:18 |
| **AUGUST** | 22:27 | 18:10 | 15:58 | 21:18 | 28:41 |
| **SEPTEMBER** | 0:00 | 0:00 | 0:00 | 0:00 | 0:00 |

| | HAILSTOP 1 - Beech King Air | | | HAILSTOP 2 - Cessna 340A | | | | HAILSTOP 3 - Beech King Air | | | HAILSTOP 4 - Cessna 340A | | | | HAILSTOP 5 - Beech King Air | | | Daily Totals | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| STORM DAY | Flight Time | EJ Flares | BIP Flares | Flight Time | EJ Flares | BIP 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 AgI (grams) |
| JUNE | | | | | | | | | | | | | | | | | | | |
| 3-Jun-14 | | | | | | | | | | | | | | | 1:23 | | | | |
| 4-Jun-14 | | | | | | | | | | | 1:00 | | | 48 | | | | 1 | 97 |
| 9-Jun-14 | 2:31 | 103 | 11 | | | | | 2:29 | 228 | 18 | | | | | 1:07 | | | 5 | 10,970 |
| 10-Jun-14 | | | | 2:03 | | 5 | 150 | | | | | | | | | | | 2 | 1,054 |
| 16-Jun-14 | | | | | | | | | | | | | | | 1:46 | 38 | 8 | 1 | 1,960 |
| 20-Jun-14 | 3:43 | 284 | 25 | 4:45 | | 24 | 334 | 1:12 | 135 | 12 | 3:50 | | 5 | 314 | 1:29 | 76 | 2 | 7 | 21,414 |
| 24-Jun-14 | | | | 0:54 | | 1 | 26 | | | | 1:48 | | 3 | 96 | 3:19 | 189 | 8 | 3 | 5,827 |
| 25-Jun-14 | 1:30 | | | | | | | | | | | | | | | | | | |
| 26-Jun-14 | | | | | | | | | | | | | | | 2:18 | 113 | 4 | | |
| 27-Jun-14 | 6:14 | 186 | 28 | 2:54 | | 4 | 138 | 2:39 | 252 | 22 | 3:05 | | 13 | 228 | 2:24 | 110 | 7 | 2 | 2,860 |
| 28-Jun-14 | 0:57 | 24 | 5 | 0:24 | | | 30 | | | | | | | | 0:58 | 6 | | 2 | 1,411 |
| JULY | | | | | | | | | | | | | | | | | | | |
| 3-Jul-14 | 2:00 | | | 2:08 | | 12 | 112 | 1:16 | 170 | 8 | 4:30 | | 15 | 294 | | | | 1 | 9,473 |
| 4-Jul-14 | 0:57 | | | | | | | | | | | | | | | | | | |
| 5-Jul-14 | 1:29 | | | 1:57 | | 9 | 92 | 1:15 | 233 | 4 | 1:46 | | 11 | 160 | 1:59 | 181 | 10 | 2 | 13,891 |
| 6-Jul-14 | 4:50 | 447 | 32 | 1:22 | | 12 | 126 | 3:17 | 291 | 16 | 1:49 | | 4 | 76 | 1:36 | 225 | 5 | 5 | 30,020 |
| 9-Jul-14 | 1:51 | 268 | 9 | 4:07 | | 18 | 322 | 1:42 | 296 | 5 | 2:20 | | 15 | 186 | 2:18 | 145 | 3 | 3 | 22,710 |
| 16-Jul-14 | 3:14 | 271 | 11 | | | | | | | | 2:18 | 90 | 6 | 126 | | | | 2 | 10,026 |
| 17-Jul-14 | 2:24 | 216 | 11 | 2:38 | | 9 | 234 | 2:25 | 199 | 12 | 3:48 | | 18 | 282 | 3:24 | 236 | 7 | 7 | 22,616 |
| 19-Jul-14 | 1:40 | 170 | 12 | 2:21 | | 10 | 154 | 1:29 | 198 | 12 | 2:33 | | 17 | 232 | | | | 3 | 15,793 |
| 20-Jul-14 | | | | | | | | | | | | | | | 3:23 | 243 | 2 | 3 | 5,160 |
| 22-Jul-14 | | | | | | | | | | | 1:28 | | | | | | | | |
| 23-Jul-14 | 3:10 | 213 | 21 | | | | | | | | | | | | 2:09 | | | 1 | 7,410 |
| 29-Jul-14 | | | | | | | | | | | | | | | 0:33 | | | | |
| 30-Jul-14 | 0:44 | | | 1:35 | | 3 | 54 | | | | | | | | | | | 1 | 560 |
| 31-Jul-14 | 2:31 | | | 4:06 | | 6 | 188 | | | | | | | | 3:56 | 53 | 6 | 4 | 3,241 |
| AUGUST | | | | | | | | | | | | | | | | | | | |
| 3-Aug-14 | 1:40 | 103 | 16 | 1:24 | | 11 | 144 | 2:43 | 215 | 14 | 0:37 | | 1 | 44 | 3:10 | 213 | 8 | 4 | 18,501 |
| 4-Aug-14 | 2:53 | 253 | 19 | 2:35 | | 12 | 178 | 1:39 | 300 | 21 | 2:12 | | 4 | 136 | 2:54 | 105 | 15 | 6 | 24,447 |
| 6-Aug-14 | 7:18 | 445 | 32 | 4:53 | | 20 | 368 | 2:36 | 285 | 17 | 2:57 | | 20 | 268 | 1:48 | 306 | 9 | 5 | 36,710 |
| 7-Aug-14 | 4:04 | 286 | 28 | 3:20 | | 24 | 284 | 3:16 | 399 | 25 | 5:58 | | 35 | 420 | 4:01 | 506 | 31 | 8 | 46,698 |
| 8-Aug-14 | 1:43 | 105 | 3 | | | | | | | | 3:41 | | 1 | 94 | 2:37 | 87 | 4 | 3 | 5,231 |
| 13-Aug-14 | | | | | | | | | | | | | | | 2:26 | 67 | | 1 | 1,340 |
| 14-Aug-14 | 1:29 | 10 | 2 | 2:23 | | | 206 | 1:01 | 47 | 4 | | | | | | | | 3 | 2,458 |
| 15-Aug-14 | 0:54 | | | | | | | | | | 1:31 | | 1 | 60 | 2:08 | 199 | 11 | 2 | 5,902 |
| 16-Aug-14 | | | | | | | | | | | | | | | 3:23 | 38 | 4 | 2 | 1,360 |
| 19-Aug-14 | 1:49 | 170 | 3 | 1:39 | | 11 | 128 | 2:14 | 148 | 8 | 2:03 | | 9 | 200 | 2:51 | 175 | 5 | 2 | 15,925 |
| 27-Aug-14 | | | | | | | | 0:33 | 40 | 2 | 0:31 | | 2 | 20 | | | | 1 | 1,441 |
| 29-Aug-14 | | | | | | | | 1:00 | | | | | | | | | | | |
| 30-Aug-14 | 0:37 | | | 1:56 | | 7 | 140 | 0:56 | 122 | 7 | 1:48 | | 10 | 166 | 3:23 | 269 | 8 | 3 | 13,241 |
| SEPTEMBER | | | | | | | | | | | | | | | | | | | |
| none | | | | | | | | | | | | | | | | | | | |

Tables are seed and patrol only
All flight times are AIR time, not engine time

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APPENDIX D – Flight Summary Table

***ALBERTA HAIL SUPPRESSION PROJECT 2014 - Universal Time Coordinates***

| MONTHLY FLIGHT TIME TOTAL: | JUNE | JULY | AUGUST | SEPTEMBER | Season Total |
|---|---|---|---|---|---|
| HS1 | 18:01 | 26:48 | 24:35 | 1:12 | **70:36** |
| HS2 | 13:26 | 23:42 | 22:54 | 0:00 | **60:02** |
| HS3 | 7:31 | 13:52 | 19:22 | 0:00 | **40:45** |
| HS4 | 11:45 | 25:21 | 26:01 | 0:43 | **63:50** |
| HS5 | 16:57 | 22:56 | 30:59 | 1:19 | **72:11** |
| | | | | | 307:24 |

| | | TOTAL TIME | AIR TIME |
|---|---|---|---|
| *HailStop #1 - N904DK* | Seeding hours: | 262:07 | 238:05 |
| *HailStop #2- N457DM* | Patrol hours: | 25:28 | 21:29 |
| *HailStop #3- N522JP* | Reposition hours: | 3:40 | 2:24 |
| *HailStop #4- N98585* | PR hours: | 9:28 | 5:38 |
| *HailStop #5- N518TS* | Mx hours: | 6:41 | 3:45 |
| | Training hours: | 0:00 | 0:00 |
| | Ferry hours: | 0:00 | 0:00 |
| | Cur hours: | 0:00 | 0:00 |
| | | 307:24 | 271:21 |

| MONTHLY FLARE USAGE: | | JUNE | JULY | AUGUST | SEPTEMBER | Season Total |
|---|---|---|---|---|---|---|
| HS1 | BIP | 69 | 96 | 103 | 0 | **268** |
| | EJECT | 597 | 1585 | 1372 | 0 | **3554** |
| HS2 | BIP | 34 | 79 | 85 | 0 | **198** |
| | EJECT | 0 | 0 | 0 | 0 | **0** |
| | BURNERS | 678 | 1282 | 1448 | 0 | **3408** |
| HS3 | BIP | 52 | 57 | 98 | 0 | **207** |
| | EJECT | 615 | 1387 | 1556 | 0 | **3558** |
| HS4 | BIP | 21 | 86 | 83 | 0 | **190** |
| | EJECT | 0 | 90 | 0 | 0 | **90** |
| | BURNERS | 686 | 1356 | 1408 | 0 | **3450** |
| HS5 | BIP | 29 | 33 | 95 | 0 | **157** |
| | EJECT | 532 | 1083 | 1965 | 0 | **3580** |

(Storm-day chemical totals ONLY include flares spent for seeding).
(Storm-day totals ONLY include flight hours for seed and patrol).

| | | | | | | | | | | | | Storm-Day Sub-Totals | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TOTALS | # Flights: 166 | | | 307:24 | | | 271:21 | 10782 | 1020 | 6858 | | Total Time for the Day | Total EJ | Total BIP | Total Burner | | ** Only flares spent for seeding. | 101 | | | |
| Date (UTC) | Aircraft | Engine On (UTC) | Engine Off (UTC) | Total Time (hh:mm) | Take-Off Time (UTC) | Landing Time (UTC) | Air Time (hh:mm) (all flights) | EJ (#) *used in flight tests | BIP (#) *used in flight tests | Burner Minutes *Test burns | Flight Type | 287:35 | 10782 | 1020 | 6858 | Seed Amount (Per Day) (Grams) | Season Seed Accumulation (Grams)** | # Storms | Captain | Co-Pilot | Observer |
| 03-Jun-14 | HS5 | 21:42 | 23:23 | 1:41 | 21:55 | 23:18 | 1:23 | 0 | 0 | 0 | PATROL | 1:41 | 0 | 0 | 0 | 0 | 0 | 0 | JT | JF | TL |
| 04-Jun-14 | HS4 | 23:20 | 0:35 | 1:15 | 23:30 | 0:30 | 1:00 | 0 | 0 | 48 | SEED | 1:15 | 0 | 0 | 48 | 97 | 97 | 1 | JN | MT | |
| 09-Jun-14 | HS1 | 18:44 | 21:27 | 2:43 | 18:53 | 21:24 | 2:31 | 103 | 11 | 0 | SEED | | | | | 0 | 97 | 3 | JM | JE | TL |
| 09-Jun-14 | HS3 | 19:25 | 22:15 | 2:50 | 19:40 | 22:09 | 2:29 | 228 | 18 | 0 | SEED | | | | | 0 | 97 | 2 | RT | JZ | |
| 09-Jun-14 | HS5 | 20:40 | 22:03 | 1:23 | 20:52 | 21:59 | 1:07 | 0 | 0 | 0 | PATROL | 6:56 | 331 | 29 | 0 | 10970 | 11067 | 0 | JT | JF | |
| 11-Jun-14 | HS2 | 1:05 | 3:19 | 2:14 | 1:12 | 3:15 | 2:03 | 0 | 5 | 150 | SEED | 2:14 | 0 | 5 | 150 | 1054 | 12122 | 2 | AB | BK | JF |
| 16-Jun-14 | HS5 | 21:37 | 23:37 | 2:00 | 21:48 | 23:34 | 1:46 | 38 | 8 | 0 | SEED | 2:00 | 38 | 8 | 0 | 1960 | 14082 | 1 | JT | JF | |

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| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 18-Jun-14 | HS1 | 18:19 | 19:05 | 0:46 | 18:32 | 19:02 | 0:30 | 0 | 0 | 0 | MX | | | | | 0 | 14082 | 0 | JM | JE | TL |
| 18-Jun-14 | HS2 | 18:51 | 19:27 | 0:36 | 19:05 | 19:24 | 0:19 | 0 | 0 | 0 | MX | | | | | 0 | 14082 | 0 | AMB | BK | |
| 18-Jun-14 | HS4 | 21:20 | 21:51 | 0:31 | 21:29 | 21:45 | 0:16 | 0 | 0 | 0 | MX | 0:00 | 0 | 0 | 0 | 0 | 14082 | 0 | JN | MT | |
| 20-Jun-14 | HS3 | 18:24 | 18:50 | 0:26 | 18:32 | 18:45 | 0:13 | 0 | 0 | 0 | MX | | | | | 0 | 14082 | 0 | RT | JZ | |
| 20-Jun-14 | HS2 | 21:00 | 21:50 | 0:50 | 21:07 | 21:45 | 0:38 | 0 | 0 | 0 | PATROL | | | | | 0 | 14082 | 0 | AB | AMB | |
| 20-Jun-14 | HS2 | 22:15 | 1:40 | 3:25 | 22:30 | 1:35 | 3:05 | 0 | 21 | 260 | SEED | | | | | 0 | 14082 | 3 | AB | AMB | |
| 21-Jun-14 | HS1 | 0:05 | 4:05 | 4:00 | 0:10 | 3:53 | 3:43 | 284 | 25 | 0 | SEED | | | | | 0 | 14082 | 2 | JM | TL | |
| 21-Jun-14 | HS3 | 0:19 | 1:42 | 1:23 | 0:24 | 1:36 | 1:12 | 135 | 12 | 0 | SEED | | | | | 0 | 14082 | 1 | RT | JZ | |
| 21-Jun-14 | HS4 | 0:34 | 4:35 | 4:01 | 0:44 | 4:34 | 3:50 | 0 | 5 | 314 | SEED | | | | | 0 | 14082 | 0 | JN | MT | |
| 21-Jun-14 | HS5 | 3:15 | 5:04 | 1:49 | 3:26 | 4:55 | 1:29 | 76 | 2 | 0 | SEED | | | | | 0 | 14082 | 0 | JT | JE | JF |
| 21-Jun-14 | HS2 | 3:20 | 4:40 | 1:20 | 3:32 | 4:34 | 1:02 | 0 | 3 | 74 | SEED | 16:48 | 495 | 68 | 648 | 21414 | 35496 | 1 | AB | AMB | |
| 23-Jun-14 | HS1 | 17:01 | 17:36 | 0:35 | 17:19 | 17:32 | 0:13 | 0 | 0 | 0 | PR | | | | | 0 | 35496 | 0 | JM | TL | |
| 23-Jun-14 | HS1 | 22:31 | 23:02 | 0:31 | 22:47 | 23:00 | 0:13 | 0 | 0 | 0 | PR | | | | | 0 | 35496 | 0 | JM | TL | |
| 24-Jun-14 | HS4 | 22:32 | 23:08 | 0:36 | 22:42 | 23:02 | 0:20 | 0 | 0 | 0 | REPO | | | | | 0 | 35496 | 0 | JN | MT | |
| 24-Jun-14 | HS2 | 23:00 | 0:05 | 1:05 | 23:07 | 0:01 | 0:54 | 0 | 1 | 26 | SEED | | | | | 0 | 35496 | 1 | AB | BK | |
| 24-Jun-14 | HS5 | 23:00 | 2:35 | 3:35 | 23:14 | 2:33 | 3:19 | 189 | 8 | 0 | SEED | | | | | 0 | 35496 | 2 | JT | JE | JF |
| 25-Jun-14 | HS4 | 0:20 | 2:18 | 1:58 | 0:25 | 2:13 | 1:48 | 0 | 3 | 96 | SEED | 6:38 | 189 | 12 | 122 | 5827 | 41323 | 0 | JN | MT | |
| 25-Jun-14 | HS1 | 12:07 | 13:49 | 1:42 | 12:15 | 13:45 | 1:30 | 0 | 0 | 0 | PATROL | 1:42 | 0 | 0 | 0 | 0 | 41323 | 0 | JM | TL | |
| 26-Jun-14 | HS5 | 23:14 | 1:49 | 2:35 | 23:28 | 1:46 | 2:18 | 113 | 4 | 0 | SEED | 2:35 | 113 | 4 | 0 | 2860 | 44183 | 2 | JT | JE | |
| 27-Jun-14 | HS1 | 19:46 | 0:08 | 4:22 | 19:55 | 0:06 | 4:11 | 72 | 15 | 0 | SEED | | | | | 0 | 44183 | 3 | JM | TL | |
| 27-Jun-14 | HS3 | 20:45 | 23:37 | 2:52 | 20:53 | 23:32 | 2:39 | 252 | 22 | 0 | SEED | | | | | 0 | 44183 | 1 | RT | JZ | |
| 27-Jun-14 | HS4 | 21:09 | 22:28 | 1:19 | 21:19 | 22:26 | 1:07 | 0 | 4 | 74 | SEED | | | | | 0 | 44183 | 0 | JN | MT | |
| 27-Jun-14 | HS2 | 21:23 | 23:33 | 2:10 | 21:36 | 23:31 | 1:55 | 0 | 2 | 98 | SEED | | | | | 0 | 44183 | 0 | AB | BK | JF |
| 27-Jun-14 | HS5 | 22:38 | 1:18 | 2:40 | 22:50 | 1:14 | 2:24 | 110 | 7 | 0 | SEED | | | | | 0 | 44183 | 1 | JT | JE | |
| 27-Jun-14 | HS4 | 23:13 | 1:18 | 2:05 | 23:18 | 1:16 | 1:58 | 0 | 9 | 154 | SEED | | | | | 0 | 44183 | 0 | JN | MT | |
| 28-Jun-14 | HS1 | 1:28 | 3:44 | 2:16 | 1:37 | 3:40 | 2:03 | 114 | 13 | 0 | SEED | | | | | 0 | 44183 | 1 | JM | TL | AB |
| 28-Jun-14 | HS2 | 1:32 | 2:44 | 1:12 | 1:42 | 2:41 | 0:59 | 0 | 2 | 40 | SEED | 18:56 | 548 | 74 | 366 | 22802 | 66985 | 0 | AB | BK | |
| 28-Jun-14 | HS5 | 20:26 | 21:40 | 1:14 | 20:38 | 21:36 | 0:58 | 6 | 0 | 0 | SEED | | | | | 0 | 66985 | 1 | JT | JE | |
| 29-Jun-14 | HS1 | 2:26 | 3:32 | 1:06 | 2:32 | 3:29 | 0:57 | 24 | 5 | 0 | SEED | | | | | 0 | 66985 | 1 | JM | TL | |
| 29-Jun-14 | HS2 | 2:46 | 3:20 | 0:34 | 2:53 | 3:17 | 0:24 | 0 | 0 | 30 | SEED | 2:54 | 30 | 5 | 30 | 1411 | 68396 | 0 | AB | BK | |
| 03-Jul-14 | HS1 | 19:36 | 21:48 | 2:12 | 19:44 | 21:44 | 2:00 | 0 | 0 | 0 | PATROL | | | | | 0 | 68396 | 0 | JM | TL | |
| 03-Jul-14 | HS4 | 19:45 | 20:31 | 0:46 | 19:55 | 20:25 | 0:30 | 0 | 0 | 0 | PATROL | | | | | 0 | 68396 | 0 | JN | MT | |
| 03-Jul-14 | HS4 | 20:45 | 21:45 | 1:00 | 20:51 | 21:39 | 0:48 | 0 | 0 | 0 | PATROL | | | | | 0 | 68396 | 0 | JN | MT | |
| 03-Jul-14 | HS4 | 23:40 | 3:10 | 3:30 | 23:50 | 3:02 | 3:12 | 0 | 15 | 294 | SEED | | | | | 0 | 68396 | 1 | JN | MT | |
| 04-Jul-14 | HS2 | 1:20 | 3:39 | 2:19 | 1:29 | 3:37 | 2:08 | 0 | 12 | 112 | SEED | | | | | 0 | 68396 | 0 | AB | BK | |
| 04-Jul-14 | HS3 | 1:37 | 3:08 | 1:31 | 1:48 | 3:04 | 1:16 | 170 | 8 | 0 | SEED | 11:18 | 170 | 35 | 406 | 9473 | 77870 | 0 | JF | JZ | |
| 04-Jul-14 | HS2 | 16:42 | 17:19 | 0:37 | 16:55 | 17:17 | 0:22 | 0 | 0 | 0 | PR | | | | | 0 | 77870 | 0 | AB | BK | |
| 04-Jul-14 | HS2 | 22:52 | 0:00 | 1:08 | 23:00 | 23:57 | 0:57 | 0 | 0 | 0 | PATROL | 1:08 | 0 | 0 | 0 | 0 | 77870 | 0 | AB | BK | |
| 05-Jul-14 | HS5 | 23:16 | 1:30 | 2:14 | 23:29 | 1:28 | 1:59 | 181 | 10 | 0 | SEED | | | | | 0 | 77870 | 1 | JT | JE | |
| 05-Jul-14 | HS4 | 23:27 | 1:27 | 2:00 | 23:37 | 1:23 | 1:46 | 0 | 11 | 160 | SEED | | | | | 0 | 77870 | 0 | JN | MT | |
| 06-Jul-14 | HS2 | 1:35 | 3:45 | 2:10 | 1:46 | 3:43 | 1:57 | 0 | 9 | 92 | SEED | | | | | 0 | 77870 | 1 | AB | BK | |
| 06-Jul-14 | HS3 | 1:50 | 3:21 | 1:31 | 1:59 | 3:14 | 1:15 | 233 | 4 | 0 | SEED | | | | | 0 | 77870 | 0 | RT | JZ | |
| 06-Jul-14 | HS1 | 1:52 | 3:31 | 1:39 | 2:01 | 3:30 | 1:29 | 0 | 0 | 0 | PATROL | 9:34 | 414 | 34 | 252 | 13891 | 91761 | 0 | JM | TL | |
| 06-Jul-14 | HS1 | 21:54 | 1:04 | 3:10 | 22:03 | 0:56 | 2:53 | 303 | 18 | 0 | SEED | | | | | 0 | 91761 | 2 | JM | TL | |
| 06-Jul-14 | HS2 | 22:10 | 23:41 | 1:31 | 22:17 | 23:39 | 1:22 | 0 | 12 | 126 | SEED | | | | | 0 | 91761 | 0 | AB | BK | |
| 06-Jul-14 | HS5 | 23:23 | 1:25 | 2:02 | 23:35 | 1:11 | 1:36 | 225 | 5 | 0 | SEED | | | | | 0 | 91761 | 0 | JT | JE | |
| 06-Jul-14 | HS4 | 23:56 | 1:56 | 2:00 | 0:01 | 1:50 | 1:49 | 0 | 4 | 76 | SEED | | | | | 0 | 91761 | 1 | JN | MT | |
| 07-Jul-14 | HS3 | 0:29 | 4:01 | 3:32 | 0:38 | 3:55 | 3:17 | 291 | 16 | 0 | SEED | | | | | 0 | 91761 | 1 | JF | JZ | |
| 07-Jul-14 | HS1 | 2:13 | 4:20 | 2:07 | 2:17 | 4:14 | 1:57 | 144 | 14 | 0 | SEED | 14:22 | 963 | 69 | 202 | 30020 | 121780 | 1 | JM | TL | |
| 09-Jul-14 | HS2 | 22:07 | 2:25 | 4:18 | 22:16 | 2:23 | 4:07 | 0 | 18 | 322 | SEED | | | | | 0 | 121780 | 2 | AB | BK | |
| 09-Jul-14 | HS1 | 22:54 | 0:57 | 2:03 | 23:04 | 0:55 | 1:51 | 268 | 9 | 0 | SEED | | | | | 0 | 121780 | 0 | JF | TL | |
| 09-Jul-14 | HS4 | 22:58 | 1:36 | 2:38 | 23:12 | 1:32 | 2:20 | 0 | 15 | 186 | SEED | | | | | 0 | 121780 | 1 | JN | MT | |
| 09-Jul-14 | HS3 | 23:45 | 1:36 | 1:51 | 23:52 | 1:34 | 1:42 | 296 | 5 | 0 | SEED | | | | | 0 | 121780 | 0 | RT | JZ | |
| 10-Jul-14 | HS5 | 0:46 | 3:25 | 2:39 | 1:04 | 3:22 | 2:18 | 145 | 3 | 0 | SEED | | | | | 0 | 121780 | 0 | JT | JE | |
| 10-Jul-14 | HS3 | 2:07 | 2:30 | 0:23 | 2:13 | 2:26 | 0:13 | 0 | 0 | 0 | REPO | | | | | 0 | 121780 | 0 | RT | JZ | |
| 10-Jul-14 | HS4 | 3:24 | 3:50 | 0:26 | 3:29 | 3:45 | 0:16 | 0 | 0 | 0 | REPO | 13:29 | 709 | 50 | 508 | 22710 | 144490 | 0 | JN | MT | |
| 14-Jul-14 | HS3 | 17:26 | 17:50 | 0:24 | 17:32 | 17:46 | 0:14 | 0 | 0 | 0 | PR | | | | | 0 | 144490 | 0 | RT | JZ | |
| 14-Jul-14 | HS3 | 22:03 | 22:26 | 0:23 | 22:05 | 22:21 | 0:16 | 0 | 0 | 0 | PR | 0:00 | 0 | 0 | 0 | 0 | 144490 | 0 | RT | JZ | |

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| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17-Jul-14 | HS4 | 2:18 | 4:51 | 2:33 | 2:27 | 4:45 | 2:18 | 90 | 6 | 126 | SEED | | | | | 0 | 144490 | 1 | JN | MT | |
| 17-Jul-14 | HS1 | 2:27 | 5:54 | 3:27 | 2:35 | 5:49 | 3:14 | 271 | 11 | 0 | SEED | 6:00 | 361 | 17 | 126 | 10026 | 154516 | 1 | JM | TL | |
| 17-Jul-14 | HS4 | 18:28 | 22:27 | 3:59 | 18:35 | 22:23 | 3:48 | 0 | 18 | 282 | SEED | | | | | 0 | 154516 | 2 | MT | JN | JF |
| 17-Jul-14 | HS5 | 18:52 | 22:01 | 3:09 | 19:10 | 21:57 | 2:47 | 236 | 7 | 0 | SEED | | | | | 0 | 154516 | 2 | JT | JE | |
| 17-Jul-14 | HS3 | 19:27 | 22:02 | 2:35 | 19:34 | 21:59 | 2:25 | 199 | 12 | 0 | SEED | | | | | 0 | 154516 | 0 | RT | JZ | |
| 17-Jul-14 | HS2 | 20:21 | 23:12 | 2:51 | 20:32 | 23:10 | 2:38 | 0 | 9 | 234 | SEED | | | | | 0 | 154516 | 2 | AB | BK | |
| 17-Jul-14 | HS1 | 20:46 | 23:21 | 2:35 | 20:54 | 23:18 | 2:24 | 216 | 11 | 0 | SEED | | | | | 0 | 154516 | 1 | JM | TL | |
| 17-Jul-14 | HS5 | 23:52 | 0:45 | 0:53 | 0:05 | 0:42 | 0:37 | 0 | 0 | 0 | PATROL | 16:02 | 651 | 57 | 516 | 22616 | 177132 | 0 | JT | JE | |
| 19-Jul-14 | HS4 | 22:21 | 1:12 | 2:51 | 22:33 | 1:06 | 2:33 | 0 | 17 | 232 | SEED | | | | | 0 | 177132 | 1 | JN | MT | |
| 19-Jul-14 | HS3 | 23:18 | 1:00 | 1:42 | 23:25 | 0:54 | 1:29 | 198 | 12 | 0 | SEED | | | | | 0 | 177132 | 0 | RT | JZ | |
| 19-Jul-14 | HS2 | 23:44 | 2:14 | 2:30 | 23:51 | 2:12 | 2:21 | 0 | 10 | 154 | SEED | | | | | 0 | 177132 | 2 | AB | BK | |
| 20-Jul-14 | HS1 | 0:16 | 2:05 | 1:49 | 0:22 | 2:02 | 1:40 | 170 | 12 | 0 | SEED | | | | | 0 | 177132 | 0 | JM | TL | |
| 20-Jul-14 | HS4 | 2:58 | 3:46 | 0:48 | 3:06 | 3:40 | 0:34 | 0 | 0 | 0 | REPO | 8:52 | 368 | 51 | 386 | 15793 | 192925 | 0 | JN | MT | |
| 20-Jul-14 | HS5 | 18:16 | 21:53 | 3:37 | 18:27 | 21:50 | 3:23 | 243 | 2 | 0 | SEED | 3:37 | 243 | 2 | | 5160 | 198085 | 3 | JT | JE | |
| 21-Jul-14 | HS4 | 16:27 | 17:09 | 0:42 | 16:45 | 17:06 | 0:21 | 0 | 0 | 0 | PR | | | | | 0 | 198085 | 0 | JN | MT | |
| 21-Jul-14 | HS4 | 22:20 | 22:42 | 0:22 | 22:23 | 22:40 | 0:17 | 0 | 0 | 0 | PR | 0:00 | 0 | 0 | 0 | 0 | 198085 | 0 | JN | MT | |
| 23-Jul-14 | HS4 | 0:50 | 2:36 | 1:46 | 1:02 | 2:30 | 1:28 | 0 | 0 | 0 | PATROL | 1:46 | 0 | 0 | 0 | 0 | 198085 | 0 | JN | MT | |
| 24-Jul-14 | HS5 | 0:25 | 2:48 | 2:23 | 0:35 | 2:44 | 2:09 | 0 | 0 | 0 | PATROL | | | | | 0 | 198085 | 0 | JT | JE | |
| 24-Jul-14 | HS1 | 2:42 | 6:04 | 3:22 | 2:50 | 6:00 | 3:10 | 213 | 21 | 0 | SEED | 5:45 | 213 | 21 | 0 | 7410 | 205495 | 1 | JM | TL | |
| 25-Jul-14 | HS1 | 13:42 | 14:05 | 0:23 | 13:45 | 14:00 | 0:15 | 0 | 0 | 0 | MX | 0:00 | 0 | 0 | 0 | 0 | 205495 | 0 | JM | TL | |
| 27-Jul-14 | HS1 | 15:18 | 15:45 | 0:27 | 15:31 | 15:42 | 0:11 | 0 | 0 | 0 | MX | 0:00 | 0 | 0 | 0 | 0 | 205495 | 0 | JM | TL | |
| 29-Jul-14 | HS5 | 16:46 | 17:33 | 0:47 | 17:06 | 17:29 | 0:23 | 0 | 0 | 0 | PR | | | | | 0 | 205495 | 0 | JT | JE | |
| 29-Jul-14 | HS5 | 22:42 | 23:26 | 0:44 | 22:50 | 23:23 | 0:33 | 0 | 0 | 0 | PATROL | 0:44 | 0 | 0 | 0 | 0 | 205495 | 0 | JT | JE | |
| 30-Jul-14 | HS2 | 23:27 | 1:15 | 1:48 | 23:37 | 1:12 | 1:35 | 0 | 3 | 54 | SEED | | | | | 0 | 205495 | 1 | AB | BK | |
| 30-Jul-14 | HS1 | 23:34 | 0:28 | 0:54 | 23:41 | 0:25 | 0:44 | 0 | 0 | 0 | PATROL | 2:42 | 0 | 3 | 54 | 560 | 206055 | 0 | JM | TL | |
| 31-Jul-14 | HS2 | 22:10 | 1:44 | 3:34 | 22:17 | 1:42 | 3:25 | 0 | 6 | 174 | SEED | | | | | 0 | 206055 | 3 | AB | BK | |
| 31-Jul-14 | HS5 | 22:06 | 1:28 | 3:22 | 22:19 | 1:25 | 3:06 | 45 | 5 | 0 | SEED | | | | | 0 | 206055 | 0 | JT | JE | |
| 31-Jul-14 | HS1 | 23:58 | 2:38 | 2:40 | 0:05 | 2:36 | 2:31 | 0 | 0 | 0 | PATROL | | | | | 0 | 206055 | 0 | JM | TL | |
| 01-Aug-14 | HS5 | 5:20 | 6:26 | 1:06 | 5:33 | 6:23 | 0:50 | 8 | 1 | 0 | SEED | | | | | 0 | 206055 | 1 | JT | JE | |
| 01-Aug-14 | HS2 | 5:31 | 6:27 | 0:56 | 5:43 | 6:24 | 0:41 | 0 | 0 | 14 | SEED | 11:38 | 53 | 12 | 188 | 3241 | 209296 | 0 | AB | BK | |
| 02-Aug-14 | HS2 | 23:48 | 23:59 | 0:11 | 23:50 | 23:57 | 0:07 | 0 | 0 | 0 | MX | 0:00 | 0 | 0 | 0 | 0 | 209296 | 0 | AB | BK | |
| 03-Aug-14 | HS3 | 21:05 | 0:00 | 2:55 | 21:13 | 23:56 | 2:43 | 215 | 14 | 0 | SEED | | | | | 0 | 209296 | 2 | RT | JZ | |
| 03-Aug-14 | HS5 | 21:18 | 0:42 | 3:24 | 21:30 | 0:40 | 3:10 | 213 | 8 | 0 | SEED | | | | | 0 | 209296 | 1 | JT | JE | |
| 03-Aug-14 | HS4 | 23:00 | 23:49 | 0:49 | 23:08 | 23:45 | 0:37 | 0 | 1 | 44 | SEED | | | | | 0 | 209296 | 0 | JN | MT | |
| 03-Aug-14 | HS2 | 23:18 | 0:52 | 1:34 | 23:25 | 0:49 | 1:24 | 0 | 11 | 144 | SEED | | | | | 0 | 209296 | 0 | AB | BK | |
| 04-Aug-14 | HS1 | 0:22 | 2:11 | 1:49 | 0:29 | 2:09 | 1:40 | 103 | 16 | 0 | SEED | 10:31 | 531 | 50 | 188 | 18501 | 227797 | 1 | JM | TL | |
| 04-Aug-14 | HS1 | 19:48 | 22:51 | 3:03 | 19:55 | 22:48 | 2:53 | 253 | 19 | 0 | SEED | | | | | 0 | 227797 | 3 | JM | TL | |
| 04-Aug-14 | HS2 | 19:56 | 22:09 | 2:13 | 20:04 | 22:05 | 2:01 | 0 | 12 | 178 | SEED | | | | | 0 | 227797 | 0 | AB | BK | |
| 04-Aug-14 | HS5 | 20:02 | 23:08 | 3:06 | 20:11 | 23:05 | 2:54 | 105 | 15 | 0 | SEED | | | | | 0 | 227797 | 1 | JT | JE | |
| 04-Aug-14 | HS4 | 22:16 | 0:50 | 2:34 | 22:28 | 0:40 | 2:12 | 0 | 4 | 136 | SEED | | | | | 0 | 227797 | 1 | JN | MT | |
| 04-Aug-14 | HS3 | 22:38 | 0:29 | 1:51 | 22:46 | 0:25 | 1:39 | 300 | 21 | 0 | SEED | | | | | 0 | 227797 | 1 | RT | JZ | |
| 04-Aug-14 | HS2 | 23:08 | 23:50 | 0:42 | 23:12 | 23:46 | 0:34 | 0 | 0 | 0 | PATROL | 13:29 | 658 | 71 | 314 | 24447 | 252244 | 0 | AB | BK | |
| 05-Aug-14 | HS2 | 13:18 | 13:58 | 0:40 | 13:26 | 13:53 | 0:27 | 0 | 0 | 0 | MX | | | | | 0 | 252244 | 0 | AB | BK | |
| 05-Aug-14 | HS2 | 19:28 | 20:25 | 0:57 | 19:42 | 20:21 | 0:39 | 0 | 0 | 0 | MX | 0:00 | 0 | 0 | 0 | 0 | 252244 | 0 | AB | BK | |
| 06-Aug-14 | HS1 | 16:48 | 17:12 | 0:24 | 16:53 | 17:11 | 0:18 | 0 | 0 | 0 | PR | | | | | 0 | 252244 | 0 | JM | TL | |
| 06-Aug-14 | HS1 | 21:15 | 1:00 | 3:45 | 21:19 | 0:58 | 3:39 | 293 | 28 | 0 | SEED | | | | | 0 | 252244 | 2 | JM | TL | |
| 06-Aug-14 | HS2 | 21:21 | 0:01 | 2:40 | 21:29 | 23:56 | 2:27 | 0 | 14 | 238 | SEED | | | | | 0 | 252244 | 0 | AB | BK | |
| 06-Aug-14 | HS4 | 21:41 | 22:00 | 0:19 | 21:49 | 21:55 | 0:06 | 0 | 0 | 0 | MX | | | | | 0 | 252244 | 0 | JN | MT | |
| 06-Aug-14 | HS4 | 23:18 | 2:28 | 3:10 | 23:27 | 2:24 | 2:57 | 0 | 20 | 268 | SEED | | | | | 0 | 252244 | 0 | JN | MT | |
| 06-Aug-14 | HS5 | 23:56 | 2:01 | 2:05 | 0:07 | 1:55 | 1:48 | 306 | 9 | 0 | SEED | | | | | 0 | 252244 | 0 | JT | JE | |
| 07-Aug-14 | HS3 | 1:10 | 3:59 | 2:49 | 1:19 | 3:55 | 2:36 | 285 | 17 | 0 | SEED | | | | | 0 | 252244 | 1 | RT | JZ | |
| 07-Aug-14 | HS2 | 1:57 | 4:37 | 2:40 | 2:07 | 4:33 | 2:26 | 0 | 6 | 130 | SEED | | | | | 0 | 252244 | 0 | AB | BK | |
| 07-Aug-14 | HS1 | 2:23 | 6:09 | 3:46 | 2:27 | 6:06 | 3:39 | 152 | 4 | 0 | SEED | 20:55 | 1036 | 98 | 636 | 36710 | 288954 | 2 | JM | TL | |
| 07-Aug-14 | HS4 | 19:50 | 21:46 | 1:56 | 20:00 | 21:40 | 1:40 | 0 | 5 | 70 | SEED | | | | | 0 | 288954 | 1 | JN | MT | |
| 07-Aug-14 | HS5 | 20:45 | 22:39 | 1:54 | 20:56 | 22:36 | 1:40 | 297 | 11 | 0 | SEED | | | | | 0 | 288954 | 1 | JF | JE | |
| 07-Aug-14 | HS2 | 20:45 | 0:18 | 3:33 | 20:54 | 0:14 | 3:20 | 0 | 24 | 284 | SEED | | | | | 0 | 288954 | 2 | AB | BK | |
| 07-Aug-14 | HS1 | 21:42 | 0:13 | 2:31 | 21:50 | 0:11 | 2:21 | 286 | 15 | 0 | SEED | | | | | 0 | 288954 | 0 | JM | TL | |
| 07-Aug-14 | HS3 | 21:42 | 23:48 | 2:06 | 21:51 | 23:43 | 1:52 | 305 | 13 | 0 | SEED | | | | | 0 | 288954 | 0 | RT | JZ | |
| 07-Aug-14 | HS4 | 22:05 | 0:36 | 2:31 | 22:17 | 0:31 | 2:14 | 0 | 20 | 208 | SEED | | | | | 0 | 288954 | 0 | JN | MT | |
| 08-Aug-14 | HS3 | 0:33 | 2:03 | 1:30 | 0:36 | 2:00 | 1:24 | 94 | 12 | 0 | SEED | | | | | 0 | 288954 | 2 | RT | JZ | |
| 08-Aug-14 | HS5 | 0:48 | 3:25 | 2:37 | 1:00 | 3:21 | 2:21 | 209 | 20 | 0 | SEED | | | | | 0 | 288954 | 1 | JF | JE | |
| 08-Aug-14 | HS2 | 1:09 | 1:29 | 0:20 | 1:14 | 1:26 | 0:12 | 0 | 0 | 0 | MX | | | | | 0 | 288954 | 0 | AB | BK | |
| 08-Aug-14 | HS4 | 1:32 | 3:50 | 2:18 | 1:42 | 3:46 | 2:04 | 0 | 10 | 142 | SEED | | | | | 0 | 288954 | 0 | JN | MT | |

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| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 08-Aug-14 | HS3 | 3:02 | 3:42 | 0:40 | 3:13 | 3:37 | 0:24 | 0 | 0 | 0 | REPO | | | | | 0 | 288954 | 0 | RT | JZ | |
| 08-Aug-14 | HS1 | 3:58 | 5:49 | 1:51 | 4:04 | 5:47 | 1:43 | 0 | 13 | 0 | SEED | 22:47 | 1191 | 143 | 704 | 46698 | 335652 | 1 | JM | BK | |
| 08-Aug-14 | HS4 | 15:33 | 16:20 | 0:47 | 15:41 | 16:18 | 0:37 | 0 | 0 | 0 | REPO | | | | | 0 | 335652 | 0 | JN | MT | |
| 08-Aug-14 | HS2 | 18:37 | 18:59 | 0:22 | 18:47 | 18:54 | 0:07 | 0 | 0 | 0 | MX | | | | | 0 | 335652 | 0 | AB | BK | |
| 08-Aug-14 | HS4 | 18:55 | 22:46 | 3:51 | 19:02 | 22:43 | 3:41 | 0 | 1 | 94 | SEED | | | | | 0 | 335652 | 1 | JN | MT | |
| 08-Aug-14 | HS5 | 19:04 | 21:53 | 2:49 | 19:12 | 21:49 | 2:37 | 87 | 4 | 0 | SEED | | | | | 0 | 335652 | 1 | JT | JE | |
| 08-Aug-14 | HS1 | 21:06 | 23:06 | 2:00 | 21:10 | 22:53 | 1:43 | 105 | 3 | 0 | SEED | 8:40 | 192 | 8 | 94 | 5231 | 340882 | 1 | JM | TL | |
| 13-Aug-14 | HS5 | 22:52 | 1:32 | 2:40 | 23:02 | 1:28 | 2:26 | 67 | 0 | 0 | SEED | 2:40 | 67 | 0 | 0 | 1340 | 342222 | 1 | JT | TL | |
| 14-Aug-14 | HS2 | 16:47 | 17:22 | 0:35 | 17:00 | 17:20 | 0:20 | 0 | 0 | 0 | PR | | | | | 0 | 342222 | 0 | AB | BK | |
| 14-Aug-14 | HS2 | 23:30 | 2:01 | 2:31 | 23:36 | 1:59 | 2:23 | 0 | 0 | 206 | SEED | | | | | 0 | 342222 | 2 | AB | BK | |
| 15-Aug-14 | HS1 | 0:12 | 1:49 | 1:37 | 0:18 | 1:47 | 1:29 | 10 | 2 | 0 | SEED | | | | | 0 | 342222 | 1 | JM | TL | |
| 15-Aug-14 | HS3 | 0:52 | 2:04 | 1:12 | 0:58 | 1:59 | 1:01 | 47 | 4 | 0 | SEED | 5:20 | 57 | 6 | 206 | 2458 | 344680 | 0 | BM | JZ | |
| 15-Aug-14 | HS5 | 22:58 | 1:16 | 2:18 | 23:05 | 1:13 | 2:08 | 199 | 11 | 0 | SEED | | | | | 0 | 344680 | 2 | JT | JE | |
| 15-Aug-14 | HS4 | 23:05 | 0:58 | 1:53 | 23:18 | 0:49 | 1:31 | 0 | 1 | 60 | SEED | | | | | 0 | 344680 | 0 | JN | MT | |
| 16-Aug-14 | HS1 | 1:11 | 2:12 | 1:01 | 1:16 | 2:10 | 0:54 | 0 | 0 | 0 | PATROL | 5:12 | 199 | 12 | 60 | 5902 | 350582 | 0 | JM | TL | |
| 16-Aug-14 | HS5 | 22:51 | 2:22 | 3:31 | 22:57 | 2:20 | 3:23 | 38 | 4 | 0 | SEED | 3:31 | 38 | 4 | 0 | 1360 | 351942 | 2 | BM | JE | |
| 19-Aug-14 | HS5 | 19:58 | 23:00 | 3:02 | 20:05 | 22:56 | 2:51 | 175 | 5 | 0 | SEED | | | | | 0 | 351942 | 1 | JT | JE | |
| 19-Aug-14 | HS2 | 21:01 | 22:52 | 1:51 | 21:08 | 22:47 | 1:39 | 0 | 11 | 128 | SEED | | | | | 0 | 351942 | 0 | AB | BK | |
| 19-Aug-14 | HS4 | 21:16 | 23:30 | 2:14 | 21:24 | 23:27 | 2:03 | 0 | 9 | 200 | SEED | | | | | 0 | 351942 | 1 | JN | MT | |
| 19-Aug-14 | HS3 | 22:30 | 0:55 | 2:25 | 22:36 | 0:50 | 2:14 | 148 | 8 | 0 | SEED | | | | | 0 | 351942 | 0 | RT | JZ | |
| 20-Aug-14 | HS1 | 0:35 | 2:35 | 2:00 | 0:43 | 2:32 | 1:49 | 170 | 3 | 0 | SEED | 11:32 | 493 | 36 | 328 | 15925 | 367867 | 0 | JM | TL | |
| 22-Aug-14 | HS3 | 17:22 | 17:43 | 0:21 | 17:26 | 17:40 | 0:14 | 0 | 0 | 0 | PR | | | | | 0 | 367867 | 0 | RT | JZ | BM |
| 22-Aug-14 | HS3 | 22:24 | 22:49 | 0:25 | 22:29 | 22:44 | 0:15 | 0 | 0 | 0 | PR | 0:00 | 0 | 0 | 0 | 0 | 367867 | 0 | BM | JZ | RT |
| 28-Aug-14 | HS3 | 2:06 | 2:50 | 0:44 | 2:12 | 2:45 | 0:33 | 40 | 2 | 0 | SEED | | | | | 0 | 367867 | 1 | BM | JZ | |
| 28-Aug-14 | HS4 | 2:06 | 2:52 | 0:46 | 2:14 | 2:45 | 0:31 | 0 | 2 | 20 | SEED | 1:30 | 40 | 4 | 20 | 1441 | 369307 | 0 | JN | MT | |
| 28-Aug-14 | HS4 | 17:00 | 17:28 | 0:28 | 17:08 | 17:26 | 0:18 | 0 | 0 | 0 | PR | | | | | 0 | 369307 | 0 | JN | BM | |
| 28-Aug-14 | HS4 | 22:04 | 22:27 | 0:23 | 22:10 | 22:24 | 0:14 | 0 | 0 | 0 | PR | 0:00 | 0 | 0 | 0 | 0 | 369307 | 0 | JN | BM | |
| 30-Aug-14 | HS3 | 1:56 | 3:12 | 1:16 | 2:05 | 3:05 | 1:00 | 0 | 0 | 0 | PATROL | 1:16 | 0 | 0 | 0 | 0 | 369307 | 0 | RT | BM | |
| 30-Aug-14 | HS5 | 21:01 | 0:34 | 3:33 | 21:09 | 0:32 | 3:23 | 269 | 8 | 0 | SEED | | | | | 0 | 369307 | 2 | JT | JE | |
| 30-Aug-14 | HS4 | 21:07 | 23:09 | 2:02 | 21:18 | 23:06 | 1:48 | 0 | 10 | 166 | SEED | | | | | 0 | 369307 | 0 | JN | MT | |
| 30-Aug-14 | HS2 | 23:28 | 1:33 | 2:05 | 23:35 | 1:31 | 1:56 | 0 | 7 | 140 | SEED | | | | | 0 | 369307 | 1 | AB | BK | |
| 30-Aug-14 | HS1 | 23:38 | 0:26 | 0:48 | 23:46 | 0:23 | 0:37 | 0 | 0 | 0 | PATROL | | | | | 0 | 369307 | 0 | JM | JF | |
| 31-Aug-14 | HS3 | 0:12 | 1:20 | 1:08 | 0:19 | 1:15 | 0:56 | 122 | 7 | 0 | SEED | 9:36 | 391 | 32 | 306 | 13241 | 382548 | 0 | RT | JZ | |
| 03-Sep-14 | HS5 | 16:53 | 17:30 | 0:37 | 17:07 | 17:29 | 0:22 | 0 | 0 | 0 | PR | | | | | 0 | 382548 | 0 | JT | JE | |
| 03-Sep-14 | HS5 | 22:27 | 23:09 | 0:42 | 22:36 | 23:07 | 0:31 | 0 | 0 | 0 | PR | 0:00 | 0 | 0 | 0 | 0 | 382548 | 0 | JT | JE | |
| 09-Sep-14 | HS1 | 17:41 | 18:14 | 0:33 | 17:52 | 18:13 | 0:21 | 0 | 0 | 0 | PR | | | | | 0 | 382548 | 0 | JM | TL | |
| 09-Sep-14 | HS1 | 23:08 | 23:47 | 0:39 | 23:18 | 23:44 | 0:26 | 0 | 0 | 0 | PR | 0:00 | 0 | 0 | 0 | 0 | 382548 | 0 | JM | TL | |
| 12-Sep-14 | HS4 | 0:17 | 1:00 | 0:43 | 0:29 | 0:52 | 0:23 | 0 | 0 | 0 | MX | 0:00 | 0 | 0 | 0 | 0 | 382548 | 0 | MT | JN | |

| PILOT/OBSERVER | Initials | PILOT/OBSERVER | Initials |
|---|---|---|---|
| Andrew Brice | AB | Daniel B. Gilbert | DBG |
| Jacob Eeuwes | JE | Brad L. Waller | BLW |
| Brian Kindrat | BK | Adam R. Brainard | ARB |
| Jenny Thorpe | JT | Bruce A. Boe | BAB |
| Roger Tilbury | RT | Terry W. Krauss | TWK |
| Joel Zimmer | JZ | Mike Torris | MT |
| Jake Mitchem | JM | Terrence Lin | TL |
| Jenelle Newman | JN | Andreas M. Bertoni | AMB |
| Jody Fischer | JF | Brook Mueller | BM |

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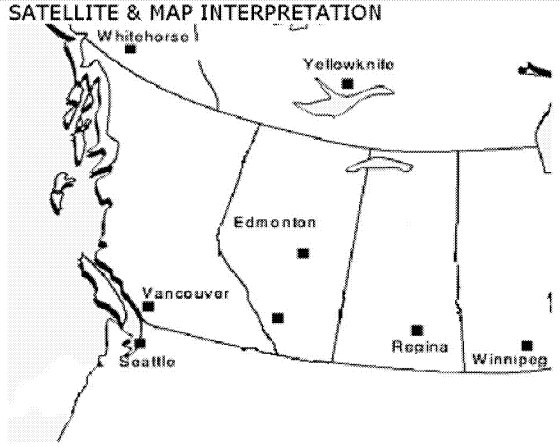
# APPENDIX E – Forms

## WMI WEATHER FORECAST WORKSHEET

**ALBERTA HAIL SUPPRESSION PROJECT 2014 – DAILY FORECAST**

SATELLITE & MAP INTERPRETATION




DATE

Forecaster

SYNOPSIS

OPERATIONAL INFORMATION FORECAST:

FCST CDC: Tmax:

Freezing Level: Dew Pt:

-5 C: Tconv:

-10 C:

Max Cloud Top Height:

Cloud Base Height/Temp:

Cell Motion:

Storm Motion:

Outlook CDC:

FORECAST

HAILCAST MODEL FCST Diam. (cm):

ACTUAL WX OBSERVED

CDC

SOUNDINGS:

- LI:
- SI:
- TOTAL TOTALS:
- Precip. Water (in):
- CAPE (J/kg):

WINDS

250 mb
500 mb
600 mb
700 mb
850 mb
Sfc

| | | | |
|---|---|---|---|
| jet PVA | Insolation | | |
| short wave trof | latent instability | | |
| thickness advection | loaded gun | | |
| wind shear | chinook | | |
| upslope flow | cloud cover | | |
| frontal lift | gusty winds | | |
| night radiation cooling | Dry Slot or Line | | |
| morning fog | NE moisture advection | | |
| morning ACC or cloud street | Other: | | |

| | Summation coverage | | Weather nature | | Precipitation type | | Obscuration type |
|---|---|---|---|---|---|---|---|
| SKC | nil cloud | MI | Shallow (FG) | DZ | Drizzle | BR | Mist (≥ 5/8 sm) |
| FEW | ≤ 2/8 | BC | Patches (FG) | RA | Rain | FG | Fog (< 5/8 sm) |
| SCT | 3/8 to 4/8 | PR | Partial (FG) | SN | Snow | FU | Smoke (≤ 6sm) |
| BKN | 5/8 to 7/8 | DR | Drifting | SG | Snow grains (never showery) | VA | Volcanic ash (any vsby) |
| OVC | 8/8 | BL | Blowing | IC | Ice crystals (≤ 6sm) | DU | Dust (≤ 6sm) |
| CLR | nil cloud < 10,000' (auto) | SH | Showers | PL | Ice pellets (frozen rain) | SA | Sand (≤ 6sm) |
| | ≥ 6 sm, no CB, no sig wx. | TS | Thunder | GR | Hail | HZ | Haze (≤ 6sm) |
| CAVOK | nil cld < 5000' or below highest min sector altitude | FZ | Freezing | GS | Snow pellets (showery) | PO | Dust whirls |
| | | VC | Vicinity | UP | Unknown (auto) | SQ | Squalls |
| | | FC | Funnel cld | | | SS | Sandstorm (< 5/8 sm) |
| | | +FC | Tornado/ Waterspout | | GRADU >1/2hr TEMPO <1 hr | +SS | Sandstorm (< 5/16 sm) |
| | | | | | RAPID <1/2hr INTER <<1hr | DS | Duststorm (< 5/8 sm) |
| | | | | | | +DS | Duststorm (< 5/16 sm) |

This forecast has been prepared by Weather Modification, Inc. meteorologists expressly for the Alberta Severe Weather Management Society to facilitate Alberta Hail Suppression Project planning and flight (Hailstop) operations. No other use is implied or intended. Not to be redistributed without ASWMS and WMI permission.

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## WMI RADAR OBSERVER LOG

**WMI Radar Log**
**2014**
**Olds-Didsbury Radar Operations Centre**

Date (UTC): _____

Operator(s): _____ Page: _____ of _____

| TIME hh:mm (UTC) | Radar Summary PRIME, storms, TITAN cells etc. | Remarks, Action, Decision | Carvel Radar* | Strathmore Radar* |
|---|---|---|---|---|
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*provide Environment Canada radar summary when Olds-Didsbury radar shows no echoes

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## WMI SEEDING AIRCRAFT FLIGHT LOG

| WMI Cloud Seeding Flight Log - Alberta 2014 | | | | | Hobbs Off: | | Engine Off: | | Landing: | | Date: mm/dd @ start of flight, 2DIGIT | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dep Airport: | | Mission Type: | | | Hobbs On: | | Engine On: | | Takeoff: | | | |
| REV. 1: 2013 | | | | | Total HOBBS: | | Total Engine: | | Flight Time: | | Page # | |
| Pilot: | | Copilot: | | | N-Number: | | HS# | | | | | |

| Time (UTC) | Event No. | Lat. (deg & min) | Long. (deg & min) | Alt. (ft) | Generators | | Flares | | Remarks and Observations |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | On | Off | Ejectable | BIP | |
| | | | | | | | | | |
| | | | | | | | | | |
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| | | | | | | | | | |
| ( - - ) | Total Seeding Attempted: | | | | | | | | |
| TOTAL Generator Time (Last 4 above) Both Units! HH:MM | Less Misfires: | | | | | | | | |
| | Total Flares Used: | | | | | | | | |

| Mission Type Categories : | | | | | | |
|---|---|---|---|---|---|---|
| | Seeding Flt | SEED | Ferry Flt | FER | Reposition Flt | REPO |
| | Patrol Flt | PAT | Publicity Flt | PR | | |
| | Maintenance | MX | Currency Flt | CUR | | |

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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

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APPENDIX G – Ground School Agenda

WEATHER MODIFICATION
INCORPORATED

# Alberta Hail Suppression Project (AHSP)

2014 Ground School – Wednesday May 28th 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<br>Mr. Jim Sweeney, WMI Vice President<br>Dr. Terry Krauss, Alberta Severe Weather Management Society (ASWMS) Project Director<br>Mr. Bruce Boe, WMI Director of Meteorology |
| 09:00 | Introduction from the Insurance Industry<br>Ken DeDecker, Alberta Severe Weather Management Society Board Director |
| 09:15 | History of the Alberta Hail Suppression Program<br>Terry Krauss |
| 10:00 | Break |
| 10:15 | Hail Program Overview and Status of Hail Suppression Concepts<br>Bruce Boe |
| 10:45 | Overview of 1996-2013 Alberta Operations<br>Brad Waller, WMI Project Meteorologist |
| 11:30 | Severe Weather Forecasting & Daily Forecast Sheet<br>Dan Gilbert, WMI Chief Meteorologist |
| 12:00 | Lunch (On-Site – AHSP Provided) |
| 12:45 | ATC Controlling Procedures<br>YYC TCU Edmonton Control Center (TBA)<br>YBW Springbank Tower (TBA) |

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

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| | |
|---|---|
| 13:30 | Aviation Weather & Special Procedures<br>Cloud Seeding Aircraft & Equipment<br>Targeting - Seeding Rates<br>Storm Tracking and Directing<br>Jody Fischer, WMI Chief Pilot & Canada Project Manager |
| 14:00 | Job Responsibilities/ Duties<br>Bruce Boe<br>Terry Krauss |
| 14:45 | Break |
| 15:00 | Alberta Project Radar - Overview, 2011 Upgrades, TITAN, Interpretation of web images, VIL, CDC<br>Dan Gilbert |
| 15:20 | Daily Routines & Procedures<br>Dan Gilbert |
| 15:30 | Safety and Emergency Procedures<br>Jody Fischer |
| 16:00 | End of Ground School |

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WEATHER MODIFICATION
INCORPORATED

# Alberta Hail Suppression Project (AHSP)

2014 Ground School – Thursday May 29th Calgary, Alberta

Staybridge Suites Calgary Airport
2825 Sunridge Way NE, Calgary AB
Phone (403) 204-7829

| | |
|---|---|
| 09:30 | Field Personnel Pictures |
| 09:50 | Presentation of 2013 Photography Contest Awards |
| 10:00 | WMI Representation and Professionalism<br>WMI Job Responsibilities/ Duties<br>Jody Fischer, WMI Chief Pilot & Canada Project Manager<br>Bruce Boe, WMI Director of Meteorology |
| 10:30 | Approved Flight Operations<br>Aircraft Maintenance Procedures & Pilot Discussion<br>Aircraft Binders, NAFTA<br>Aircraft Refueling Procedures<br>Jody Fischer |
| 11:00 | SharePoint Introduction<br>Paperwork Procedures<br>Erin Fischer, WMI Project Assistant |
| 11:45 | Accounting – Company Expense Reports |
| 12:00 | Team Lunch (WMI Provided) |
| 13:00 | Hands-on SharePoint Session with Field Crew<br>Erin Fischer |
| 14:30 | Cloud Seeding Chemical Inventory & Procedures<br>Jody & Erin Fischer |
| 14:45 | Additional Project Discussion – Q & A |
| 15:15 | End of Ground School |

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

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APPENDIX H – Airborne Seeding Solution

- Chemical Formulation: 2% AgI - 0.5 $NH_4I$ - 0.1 $C_6H_4Cl_2$ - 1.0 $NaClO_4$
- 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 | $NH_4I$ | 144.94 | 93.9 | 0.21 | n/a |
| Paradichloro-benzene | $C_6H_4Cl_2$ | 147.00 | 19.0 | 0.042 | n/a |
| Sodium Perchlorate, 99% | $NaClO_4$ | 140.48 | 181.8 | 0.40 | n/a |
| Water | $H_2O$ | 17.99 | 607.7 or less | 1.34 | 0.202 |
| Acetone | $(CH_3)_2CO$ | 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

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## APPENDIX I – Daily Meteorological Forecast Statistics

**June 2014**

| 2014 Date | Forecast CDC | Precipitable Water (inches) | 0°C Level (kft) | -5°C Level (kft) | -10°C Level (kft) | Cloud Base Height (kft) | Cloud Base Temp (°C) | Maximum Cloud Top Height (kft) | Temp. Maximum (°C) | Dew Point (°C) | Conv Temp (°C) | CAPE (J/kg) | Total Totals | Lifted Index | Showalter Index | Cell Direction (deg) | Cell Speed (knots) | Storm Direction (deg) | Storm Speed (knots) | Low Level Wind Direction (deg) | Low Level Wind Speed (kts) | Mid Level Wind Direction (deg) | Mid Level Wind Speed (knots) | High Level Wind Direction (deg) | High Level Wind Speed (knots) | Observed CDC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1-Jun | 2 | 0.75 | 9.8 | 11.8 | 14.4 | 8 | 5.2 | 32.8 | 20 | 9 | 18 | 1014 | 57.3 | -4 | -2.9 | 255 | 10 | 285 | 5 | 230 | 5 | 270 | 10 | 275 | 20 | 1 |
| 2-Jun | 1 | 0.59 | 10.2 | 12 | 14.3 | 9.1 | 3.4 | 29.5 | 19 | 7 | 17.4 | 782 | 58.8 | -4 | -3.7 | 310 | 15 | 325 | 5 | 300 | 10 | 290 | 10 | 265 | 20 | 1 |
| 3-Jun | 2 | 0.64 | 11.0 | 12.7 | 14.9 | 10.5 | 1.5 | 32.5 | 21.5 | 5 | 18.2 | 873 | 58 | -4 | -3.4 | 305 | 10 | 305 | 5 | 300 | 10 | 270 | 15 | 230 | 25 | 2 |
| 4-Jun | 2 | 0.72 | 9.8 | 11.6 | 14.1 | 8.8 | 3 | 29.4 | 20 | 8 | 18 | 648 | 56.8 | -4 | -2.4 | 260 | 30 | 290 | 20 | 230 | 20 | 270 | 35 | 280 | 65 | 2 |
| 5-Jun | -1 | 0.35 | 6.5 | 8.2 | 9.9 | 8.1 | -4.7 | 15.5 | 10 | -1 | 8.6 | 87 | 52.9 | 2 | 2.2 | 300 | 30 | 340 | 20 | 315 | 25 | 300 | 30 | 280 | 45 | -1 |
| 6-Jun | 0 | 0.37 | 8.8 | 12.2 | 12.2 | 9.8 | -2.8 | 27.8 | 15 | 1 | 13.1 | 567 | 60.1 | -4 | -2.9 | 305 | 15 | 330 | 10 | 290 | 6 | 305 | 20 | 310 | 50 | 0 |
| 7-Jun | -1 | 0.49 | 8.8 | 10.5 | 12.4 | 9.5 | -1.9 | 26.0 | 17 | 3 | 15.4 | 441 | 58.3 | -3 | -2.1 | 310 | 30 | 340 | 15 | 310 | 20 | 310 | 30 | 310 | 55 | 0 |
| 8-Jun | 0 | 0.64 | 10.9 | 12.6 | 14.7 | 11 | -0.3 | 21.8 | 21 | 4 | 18.6 | 211 | 53.2 | -1 | -0.7 | 290 | 25 | 325 | 15 | 265 | 10 | 300 | 35 | 310 | 60 | -1 |
| 9-Jun | 2 | 0.47 | 8.9 | 10.8 | 13.2 | 7.8 | 3.2 | 28.5 | 15 | 6 | 14.8 | 635 | 57.7 | -3 | -2.6 | 280 | 35 | 305 | 25 | 290 | 25 | 265 | 40 | 260 | 65 | 3 |
| 10-Jun | 1 | 0.44 | 9.7 | 11.4 | 13.1 | 10.5 | -2.4 | 29.0 | 17.5 | 2 | 14.1 | 625 | 60.7 | -4 | -3.8 | 295 | 15 | 330 | 10 | 310 | 10 | 295 | 15 | 285 | 30 | 2 |
| 11-Jun | 1 | 0.48 | 9.5 | 11.3 | 13.7 | 9.1 | 1.3 | 26.0 | 17 | 4.5 | 15.2 | 450 | 57.3 | -3.0 | -2.3 | 295 | 10 | 340 | 10 | 290 | 10 | 315 | 15 | 315 | 70 | 0 |
| 12-Jun | 1 | 0.63 | 10.3 | 12.5 | 14.8 | 8.5 | 4 | 30.9 | 18 | 7.5 | 18.8 | 371 | 54.5 | -2 | -1.5 | 235 | 15 | 255 | 15 | 185 | 15 | 250 | 30 | 240 | 55 | 1 |
| 13-Jun | 1 | 0.69 | 7.8 | 11.1 | 14.3 | 5.5 | 7 | 30.1 | 12 | 8.5 | 8.7 | 267 | 51.2 | 0 | 0.5 | 35 | 10 | 90 | 5 | 65 | 10 | 40 | 5 | 130 | 20 | 1 |
| 14-Jun | 1 | 0.54 | 9.7 | 11.6 | 14.3 | 8.6 | 3.1 | 30.6 | 17.5 | 6 | 14.9 | 513 | 56.2 | -3 | -2.3 | 20 | 10 | 50 | 5 | 40 | 5 | 5 | 10 | 340 | 20 | 0 |
| 15-Jun | 1 | 0.64 | 9.2 | 11.1 | 13.8 | 7.9 | 3.8 | 28.4 | 18 | 7 | 15.3 | 467 | 54.3 | -2 | -1 | 145 | 5 | 185 | 5 | 140 | 15 | 200 | 5 | 220 | 20 | 1 |
| 16-Jun | 1 | 0.64 | 8.7 | 11.2 | 13.9 | 7.3 | 4 | 30.7 | 14.5 | 7.5 | 13.2 | 513 | 55.8 | -2 | -1.8 | 115 | 5 | 175 | 5 | 115 | 5 | 165 | 10 | 175 | 25 | 1 |
| 17-Jun | -1 | 0.72 | 9.3 | 12.2 | 15.6 | 6.9 | 5.7 | 15.6 | 15 | 8 | 14.7 | 115 | 49.0 | 1 | 1.4 | 80 | 15 | 95 | 10 | 55 | 20 | 60 | 15 | 155 | 45 | -1 |
| 18-Jun | -1 | 0.98 | 10.6 | 13.8 | 16.4 | 5.2 | 9.7 | 22.3 | 16 | 11 | 15.2 | 104 | 48.6 | 0 | 0.7 | 75 | 15 | 85 | 10 | 35 | 15 | 80 | 15 | 80 | 20 | -1 |
| 19-Jun | -1 | 0.79 | 10.8 | 13.5 | 16.2 | 6.6 | 8.5 | 21.3 | 16.5 | 10.5 | 17.2 | 215 | 51.6 | -2.0 | -1.1 | 320 | 20 | 350 | 15 | 315 | 15 | 330 | 20 | 330 | 55 | 2 |
| 20-Jun | 2 | 0.83 | 10.2 | 12.6 | 15.8 | 6.7 | 7.7 | 31.0 | 21 | 10 | 18.7 | 570 | 53.4 | -3 | -1.3 | 240 | 5 | 250 | 5 | 350 | 5 | 210 | 10 | 170 | 35 | 3 |
| 21-Jun | -1 | 0.61 | 10.2 | 12.2 | 14.9 | 9.1 | 3.1 | 22.0 | 19 | 10.5 | 16.7 | 268 | 53.4 | -2.0 | -1 | 300 | 15 | 335 | 10 | 310 | 15 | 295 | 15 | 270 | 15 | -1 |
| 22-Jun | 1 | 0.56 | 10.6 | 12.9 | 15.5 | 9.1 | 4.2 | 27.8 | 20 | 8 | 19.7 | 371 | 53.5 | -2.0 | -1.1 | 330 | 15 | 5 | 5 | 340 | 10 | 310 | 10 | 345 | 15 | -1 |
| 23-Jun | 1 | 0.70 | 11.9 | 13.8 | 16.7 | 10.9 | 2.9 | 33.0 | 24 | 7 | 20.7 | 633 | 55.4 | -3 | -2.5 | 275 | 5 | 270 | 5 | 260 | 5 | 265 | 5 | 295 | 10 | 1 |
| 24-Jun | 2 | 0.96 | 11.8 | 14.4 | 17.3 | 8.4 | 8.4 | 37.3 | 22 | 12 | 20.4 | 1031 | 53.6 | -4 | -2.4 | 205 | 15 | 230 | 10 | 200 | 15 | 210 | 15 | 210 | 25 | 3 |
| 25-Jun | 2 | 0.65 | 10.5 | 13.6 | 16.5 | 8.0 | 6.4 | 29.1 | 19 | 9 | 17.8 | 397 | 52.2 | -1 | -1.1 | 290 | 20 | 320 | 15 | 305 | 20 | 285 | 20 | 265 | 45 | 2 |
| 26-Jun | 2 | 0.73 | 10.6 | 12.9 | 15.9 | 8.1 | 7 | 34.7 | 22 | 10.5 | 20.7 | 703 | 55.2 | -4 | -2.6 | 295 | 5 | 270 | 5 | 280 | 5 | 240 | 15 | 200 | 30 | 2 |
| 27-Jun | 2 | 0.78 | 11.4 | 13.8 | 16.3 | 9.6 | 4.7 | 35.0 | 22 | 9 | 20.2 | 824 | 56.0 | -3.0 | -3.1 | 230 | 5 | 250 | 5 | 250 | 5 | 225 | 10 | 230 | 26 | 3 |
| 28-Jun | 2 | 0.88 | 10.3 | 13.1 | 15.9 | 5.3 | 10.4 | 32.9 | 17 | 12.5 | 16.6 | 775 | 51.4 | -3 | -0.7 | 320 | 10 | 345 | 5 | 330 | 10 | 280 | 5 | 170 | 30 | 2 |
| 29-Jun | 0 | 0.75 | 9.8 | 12.4 | 15.1 | 7.7 | 5.4 | 30.2 | 17 | 8 | 16 | 411 | 54.5 | -2 | -1.8 | 315 | 15 | 355 | 10 | 320 | 20 | 325 | 5 | 150 | 35 | 2 |
| 30-Jun | 1 | 0.79 | 11.2 | 13.7 | 16.4 | 9.6 | 3.6 | 26.5 | 21 | 8 | 19.3 | 394 | 54.4 | -3 | -2.0 | 320 | 15 | 350 | 10 | 335 | 15 | 305 | 10 | 265 | 10 | 1 |

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**July 2014**

| 2014 Date | Forecast CDC | Precipitable Water (inches) | 0°C Level (kft) | -5°C Level (kft) | -10°C Level (kft) | Cloud Base Height (kft) | Cloud Base Temp (°C) | Maximum Cloud Top Height (kft) | Temp. Maximum (°C) | Dew Point (°C) | Conv Temp (°C) | CAPE (J/kg) | Total Totals | Lifted Index | Showalter Index | Cell Direction (deg) | Cell Speed (knots) | Storm Direction (deg) | Storm Speed (knots) | Low Level Wind Direction (deg) | Low Level Wind Speed (kts) | Mid Level Wind Direction (deg) | Mid Level Wind Speed (knots) | High Level Wind Direction (deg) | High Level Wind Speed (knots) | Observed CDC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1-Jul | -2 | 0.74 | 12.1 | 16.4 | 18.9 | 9.4 | 6.3 | 15.1 | 25 | 11 | 24.3 | 67 | 47.7 | 0 | 0.9 | 310 | 15 | 330 | 10 | 275 | 10 | 305 | 20 | 305 | 40 | -3 |
| 2-Jul | 1 | 1.01 | 14.3 | 16.2 | 18.4 | 11.3 | 7.3 | 40.8 | 26 | 12 | 29.8 | 616 | 52.5 | -3 | -2.1 | 280 | 10 | 260 | 10 | 260 | 10 | 225 | 20 | 220 | 35 | -1 |
| 3-Jul | 3 | 0.96 | 13.6 | 15.7 | 18.0 | 9.6 | 10.1 | 40.8 | 29 | 15 | 29.4 | 2425 | 57.1 | -7 | -4.3 | 230 | 15 | 260 | 10 | 225 | 10 | 245 | 20 | 240 | 40 | 4 |
| 4-Jul | -1 | 0.89 | 12.4 | 15.5 | 18.9 | 9 | 7.4 | 23.9 | 25 | 11 | 24.8 | 169 | 48.9 | -1.0 | -0.1 | 250 | 25 | 280 | 15 | 245 | 15 | 255 | 45 | 260 | 55 | 1 |
| 5-Jul | 2 | 0.78 | 12.3 | 14.5 | 17.3 | 9.7 | 6.5 | 29.5 | 24 | 10 | 23.5 | 586 | 54.7 | -3 | -2.9 | 285 | 30 | 310 | 20 | 280 | 20 | 280 | 35 | 285 | 100 | 4 |
| 6-Jul | 3 | 0.87 | 11.7 | 14.2 | 17.0 | 8.9 | 7.4 | 33.2 | 22.5 | 11 | 20.5 | 989 | 55.4 | -4 | -3.1 | 300 | 25 | 325 | 20 | 305 | 20 | 290 | 30 | 285 | 80 | 4 |
| 7-Jul | -1 | 0.68 | 12.2 | 16.0 | 18.5 | 9.9 | 5.8 | 29.7 | 24 | 9.5 | 21.4 | 265 | 50.4 | -1 | -0.5 | 320 | 25 | 350 | 15 | 310 | 15 | 320 | 35 | 315 | 75 | -2 |
| 8-Jul | 1 | 0.80 | 13.6 | 16.5 | 19.1 | 9.7 | 8.3 | 36.5 | 26 | 12 | 25.9 | 845 | 52.8 | -3 | -2.4 | 305 | 15 | 330 | 10 | 275 | 10 | 310 | 10 | 305 | 45 | -2 |
| 9-Jul | 4 | 1.01 | 12.9 | 15.3 | 17.8 | 9.0 | 10 | 36.7 | 27 | 14.5 | 27.4 | 1622 | 54.7 | -6 | -3 | 255 | 25 | 295 | 15 | 250 | 10 | 260 | 40 | 260 | 70 | 5 |
| 10-Jul | 1 | 0.61 | 11.5 | 13.6 | 16.1 | 10.7 | 2.4 | 26.6 | 23 | 7 | 22.9 | 328 | 53.1 | -2 | -1.2 | 290 | 30 | 325 | 20 | 300 | 15 | 295 | 40 | 275 | 80 | 2 |
| 11-Jul | 1 | 0.70 | 12.7 | 15.2 | 17.6 | 10 | 6 | 34.8 | 23 | 9.5 | 23.9 | 645 | 53.9 | -3 | -2.3 | 305 | 20 | 340 | 10 | 305 | 15 | 310 | 20 | 350 | 35 | -3 |
| 12-Jul | -3 | 0.76 | 15.1 | 17.7 | 20.3 | 11 | 7.0 | 40.0 | 28 | 12 | 29.5 | 435 | 49.2 | -1 | -0.2 | 325 | 20 | 355 | 10 | 310 | 10 | 325 | 20 | 330 | 25 | -3 |
| 13-Jul | -3 | 0.95 | 14.5 | 17.2 | 19.8 | 10.9 | 7.8 | 40.8 | 29 | 12 | 27.8 | 1145 | 54.1 | -3 | -2.8 | 330 | 10 | 15 | 5 | 355 | 5 | 330 | 15 | 95 | 15 | -3 |
| 14-Jul | -2 | 0.94 | 14.3 | 16.8 | 19.1 | 11.3 | 5.8 | 38.1 | 26.5 | 10.5 | 27.8 | 263 | 51.9 | -2 | -1.6 | 65 | 5 | 180 | 5 | 300 | 0 | 145 | 10 | 220 | 20 | -3 |
| 15-Jul | -2 | 0.85 | 14.3 | 16.9 | 19.2 | 10.5 | 8.1 | 39.7 | 28 | 14 | 30.2 | 1035 | 52.8 | -3 | -2.5 | 335 | 20 | 5 | 10 | 355 | 15 | 350 | 15 | 300 | 25 | -2 |
| 16-Jul | 3 | 1.00 | 14.4 | 16.7 | 19.1 | 12.1 | 6.4 | 40.7 | 31 | 13 | 30.2 | 1417 | 56.5 | -5 | -3.8 | 295 | 15 | 320 | 10 | 280 | 5 | 295 | 20 | 275 | 40 | 3 |
| 17-Jul | 4 | 1.14 | 12.9 | 15.3 | 17.8 | 8.2 | 10.8 | 39.6 | 23 | 15 | 26.1 | 1922 | 50.9 | -6 | -1 | 240 | 25 | 275 | 15 | 250 | 20 | 245 | 30 | 275 | 55 | 5 |
| 18-Jul | -1 | 0.90 | 12.1 | 15.2 | 18.3 | 10.2 | 5 | 31.5 | 23 | 10 | 24.3 | 94 | 48.3 | 0 | 0.9 | 280 | 30 | 305 | 20 | 265 | 25 | 285 | 30 | 280 | 40 | -1 |
| 19-Jul | 1 | 0.78 | 11.5 | 14 | 16.9 | 8.2 | 7.5 | 29.9 | 22 | 12 | 23.1 | 492 | 49.6 | -2 | 0.6 | 275 | 40 | 305 | 30 | 275 | 30 | 270 | 50 | 270 | 95 | 4 |
| 20-Jul | 2 | 0.67 | 10.7 | 13 | 16.1 | 8.7 | 5 | 23.1 | 19.5 | 8 | 19.2 | 247 | 52.2 | -1.0 | -0.9 | 275 | 25 | 305 | 20 | 280 | 15 | 275 | 35 | 260 | 95 | 2 |
| 21-Jul | 2 | 0.86 | 9.8 | 12.7 | 15.4 | 5.4 | 9.1 | 30.7 | 16 | 12 | 16.1 | 487 | 50.9 | -2 | 0.2 | 255 | 5 | 270 | 5 | 270 | 5 | 240 | 10 | 250 | 40 | 4 |
| 22-Jul | 1 | 1.12 | 12.2 | 15.2 | 18.4 | 8.2 | 9 | 35.8 | 24 | 13 | 23.6 | 510 | 49.6 | -2.0 | -0.4 | 210 | 15 | 235 | 15 | 190 | 15 | 220 | 25 | 225 | 40 | 2 |
| 23-Jul | 4 | 0.95 | 13.5 | 16.2 | 18.9 | 9.1 | 9.5 | 38.0 | 25 | 13 | 25.6 | 1349 | 53.4 | -4 | -2.9 | 230 | 30 | 250 | 15 | 220 | 15 | 225 | 30 | 220 | 40 | 3 |
| 24-Jul | 1 | 0.57 | 10.8 | 12.5 | 14.2 | 10.5 | 1 | 27.5 | 23 | 6 | 18.5 | 806 | 59.4 | -5 | -3.8 | 260 | 10 | 275 | 5 | 285 | 20 | 230 | 15 | 155 | 25 | 2 |
| 25-Jul | -1 | 0.82 | 10.3 | 13.5 | 16.8 | 8.7 | 1.3 | 14.0 | 18 | 6.5 | 18.2 | 28 | 46.5 | 2 | 2.4 | 315 | 30 | 345 | 21 | 315 | 35 | 310 | 25 | 40 | 15 | -1 |
| 26-Jul | -1 | 0.70 | 11.4 | 14.0 | 17.5 | 8.9 | 5.7 | 23.2 | 21 | 9 | 21.3 | 170 | 49.4 | 0 | 0.4 | 300 | 25 | 320 | 15 | 295 | 20 | 285 | 25 | 285 | 35 | -1 |
| 27-Jul | 2 | 0.93 | 12.4 | 14.8 | 17.5 | 9.4 | 6.8 | 33.5 | 25.5 | 12.5 | 24.8 | 637 | 53 | -3 | -1.7 | 275 | 25 | 300 | 15 | 250 | 10 | 280 | 30 | 275 | 50 | -2 |
| 28-Jul | -2 | 0.81 | 14.3 | 16.2 | 18.2 | 12.3 | 5 | 36.3 | 28 | 10 | 30.2 | 1119 | 58.3 | -5.0 | -4.7 | 290 | 10 | 300 | 5 | 260 | 5 | 295 | 10 | 265 | 45 | -2 |
| 29-Jul | -2 | 0.90 | 14.3 | 16.3 | 18.3 | 11.4 | 7.3 | 38.8 | 29 | 15 | 32 | 1764 | 58.4 | -6.0 | -5.1 | 280 | 15 | 305 | 10 | 260 | 10 | 290 | 20 | 270 | 25 | 4 |
| 30-Jul | -2 | 0.87 | 14.3 | 16.3 | 18.2 | 11.0 | 9 | 39.8 | 30 | 16 | 32.6 | 2512 | 61.7 | -8 | -6.9 | 260 | 5 | 275 | 5 | 220 | 5 | 270 | 5 | 270 | 25 | 2 |
| 31-Jul | 4 | 1.09 | 13.5 | 15.6 | 18.0 | 8.8 | 11.4 | 40.4 | 27 | 17 | 28.8 | 2354 | 58.3 | -7 | -5.9 | 265 | 20 | 300 | 10 | 250 | 10 | 275 | 20 | 275 | 25 | 4 |

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**August 2014**

| 2014 Date | Forecast CDC | Precipitable Water (inches) | 0°C Level (kft) | -5°C Level (kft) | -10°C Level (kft) | Cloud Base Height (kft) | Cloud Base Temp (°C) | Maximum Cloud Top Height (kft) | Temp. Maximum (°C) | Dew Point (°C) | Conv Temp (°C) | CAPE (J/kg) | Total Totals | Lifted Index | Showalter Index | Cell Direction (deg) | Cell Speed (knots) | Storm Direction (deg) | Storm Speed (knots) | Low Level Wind Direction (deg) | Low Level Wind Speed (kts) | Mid Level Wind Direction (deg) | Mid Level Wind Speed (knots) | High Level Wind Direction (deg) | High Level Wind Speed (knots) | Observed CDC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1-Aug | 4 | 1.04 | 13.5 | 16.0 | 18.4 | 8.3 | 11.7 | 40.5 | 25 | 15 | 24.6 | 2544 | 57.6 | -7 | -5.8 | 285 | 20 | 310 | 10 | 240 | 10 | 285 | 20 | 275 | 20 | 4 |
| 2-Aug | 2 | 1.01 | 13.4 | 15.3 | 17.6 | 8.7 | 11.4 | 39.6 | 26 | 16 | 28.5 | 1951 | 57.9 | -7 | -5.7 | 300 | 5 | 275 | 5 | 255 | 5 | 315 | 5 | 250 | 25 | 4 |
| 3-Aug | 3 | 0.99 | 12.8 | 15.0 | 17.7 | 8.1 | 3.3 | 37.6 | 24 | 15 | 24 | 1760 | 57 | -6 | -4.9 | 40 | 1 | 295 | 1 | 70 | 2 | 270 | 5 | 220 | 20 | 4 |
| 4-Aug | 4 | 0.99 | 12.4 | 14.9 | 17.5 | 8.4 | 9.3 | 35.5 | 23 | 13 | 21.5 | 1207 | 54.3 | -4 | -2.8 | 245 | 15 | 270 | 5 | 220 | 10 | 255 | 15 | 245 | 25 | 4 |
| 5-Aug | 3 | 0.99 | 12.5 | 14.9 | 17.7 | 8.9 | 8.5 | 36.0 | 24 | 12.5 | 23.1 | 909 | 53.3 | -4.0 | -3.1 | 250 | 10 | 295 | 5 | 220 | 10 | 290 | 10 | 325 | 35 | -1 |
| 6-Aug | 3 | 0.98 | 13 | 15.2 | 17.6 | 9.4 | 8.6 | 36.2 | 26 | 15 | 27.6 | 918 | 54.8 | -4 | -2.9 | 270 | 25 | 295 | 10 | 240 | 5 | 275 | 25 | 275 | 45 | 5 |
| 7-Aug | 4 | 0.95 | 12.7 | 15.1 | 17.7 | 8.4 | 9.4 | 37.4 | 23 | 12.5 | 22.8 | 1096 | 54.6 | -4.0 | -3.4 | 260 | 30 | 290 | 15 | 250 | 15 | 265 | 30 | 270 | 70 | 4 |
| 8-Aug | 4 | 0.89 | 12.6 | 14.8 | 17.1 | 8.8 | 8.7 | 38.6 | 22 | 12.5 | 22.9 | 1364 | 57.7 | -6 | -5.2 | 225 | 20 | 255 | 15 | 230 | 15 | 230 | 30 | 230 | 60 | 5 |
| 9-Aug | -2 | 0.75 | 11.8 | 14.5 | 17.5 | 10.1 | 3.3 | 17.4 | 22 | 7 | 22.2 | 38 | 48.2 | 1 | 1.2 | 285 | 20 | 320 | 15 | 280 | 15 | 290 | 30 | 315 | 45 | -3 |
| 10-Aug | -3 | 0.99 | 12.8 | 17.6 | 20.3 | 9.3 | 6.5 | 14.6 | 25 | 10 | 25.5 | 31 | 42.4 | 3 | 3.6 | 310 | 25 | 340 | 15 | 310 | 20 | 315 | 35 | 315 | 40 | -3 |
| 11-Aug | -3 | 1.02 | 15.6 | 18.3 | 20.7 | 11.6 | 6.6 | 39.8 | 29 | 11 | 29.6 | 424 | 48.8 | -1 | -0.2 | 280 | 5 | 285 | 5 | 260 | 5 | 275 | 10 | 240 | 15 | -3 |
| 12-Aug | 2 | 1.25 | 14.2 | 17 | 19.8 | 11.1 | 7.7 | 41.5 | 30 | 11 | 31.3 | 277 | 50.2 | -1.0 | -1.1 | 180 | 20 | 220 | 15 | 180 | 15 | 200 | 20 | 215 | 25 | 0 |
| 13-Aug | 2 | 1.19 | 14.2 | 17.1 | 19.9 | 9.5 | 10 | 40.4 | 29 | 15 | 29.1 | 1404 | 52.6 | -3 | -2.9 | 250 | 5 | 270 | 5 | 285 | 5 | 230 | 15 | 235 | 15 | 2 |
| 14-Aug | 1 | 1.08 | 14.1 | 17.1 | 20.6 | 8.7 | 11.7 | 40.6 | 27 | 17 | 29.2 | 969 | 48.1 | -2 | -0.6 | 100 | 10 | 130 | 5 | 75 | 10 | 135 | 10 | 220 | 25 | 4 |
| 15-Aug | 3 | 1.32 | 13.3 | 16.2 | 19.5 | 7.8 | 11.6 | 40.4 | 25 | 17 | 25.6 | 790 | 49.7 | -3 | -1.3 | 130 | 10 | 170 | 10 | 145 | 10 | 130 | 15 | 150 | 35 | 4 |
| 16-Aug | 3 | 1.08 | 12.6 | 15.4 | 18.2 | 7.0 | 12.6 | 37.8 | 24 | 15 | 20.3 | 1577 | 54.4 | -5.0 | -4.2 | 50 | 5 | 85 | 5 | 335 | 10 | 355 | 10 | 325 | 10 | 4 |
| 17-Aug | 3 | 1.12 | 13.4 | 16.4 | 19.2 | 8.5 | 10.2 | 39.4 | 24 | 13 | 23 | 924 | 51.8 | -3.0 | -2.4 | 340 | 10 | 15 | 10 | 350 | 10 | 350 | 15 | 335 | 10 | 2 |
| 18-Aug | 0 | 0.97 | 13.9 | 16.6 | 19.5 | 9.3 | 8.7 | 36.1 | 27 | 13.5 | 27.9 | 396 | 50.1 | -2 | -1 | 285 | 15 | 305 | 10 | 275 | 10 | 275 | 20 | 275 | 15 | 1 |
| 19-Aug | 4 | 1.03 | 12.1 | 15.0 | 17.9 | 7.5 | 10.5 | 36.8 | 21.5 | 13 | 21.7 | 1091 | 53.6 | -4 | -3.4 | 260 | 20 | 285 | 10 | 260 | 15 | 255 | 20 | 235 | 35 | 4 |
| 20-Aug | 2 | 0.87 | 10.3 | 13.2 | 16.0 | 6.2 | 8.4 | 27.9 | 15.5 | 10 | 14.6 | 281 | 51.4 | -1.0 | -0.8 | 270 | 15 | 285 | 10 | 245 | 5 | 250 | 20 | 255 | 40 | 1 |
| 21-Aug | -1 | 0.71 | 9.4 | 12.3 | 14.9 | 7.1 | 5.1 | 21.6 | 15 | 7 | 14.6 | 143 | 52.3 | -1.0 | -0.1 | 220 | 5 | 275 | 5 | 195 | 5 | 260 | 15 | 240 | 35 | -1 |
| 22-Aug | -1 | 0.73 | 9.1 | 12.6 | 15.3 | 7.2 | 4.8 | 15.3 | 15 | 7 | 14.1 | 62 | 49.4 | 1 | 1.5 | 175 | 5 | 180 | 5 | 90 | 10 | 195 | 10 | 225 | 30 | -1 |
| 23-Aug | -2 | 0.68 | 10 | 13.1 | 15.9 | 7.6 | 4.8 | 13.7 | 16 | 7 | 15.3 | 38 | 49.9 | 1 | 1 | 320 | 5 | 315 | 5 | 340 | 5 | 275 | 5 | 205 | 60 | -1 |
| 24-Aug | -1 | 0.68 | 9.4 | 12.9 | 15.4 | 6.6 | 6.5 | 17.9 | 17 | 9 | 16.3 | 130 | 49.1 | 0 | 1.3 | 15 | 5 | 0 | 0 | 55 | 5 | 270 | 5 | 205 | 35 | -1 |
| 25-Aug | -1 | 0.81 | 11 | 13.3 | 16.0 | 10 | 2 | 20.0 | 21.1 | 8.1 | 22.4 | 92 | 49.5 | 0 | 0.8 | 290 | 19 | 330 | 11 | 300 | 11 | 310 | 21 | 350 | 62 | -1 |
| 26-Aug | -3 | 0.76 | 13.6 | 16.5 | 19.6 | NA | NA | NA | 25 | 7.2 | 28.1 | 0 | 45.3 | 2 | 2.4 | 305 | 18 | 325 | 11 | 300 | 12 | 295 | 21 | 295 | 33 | -2 |
| 27-Aug | 2 | 0.96 | 12.1 | 14.8 | 17.3 | 9.5 | 5.5 | 36.0 | 24.3 | 11.4 | 25.2 | 566 | 53.9 | -3 | -2.4 | 280 | 31 | 300 | 18 | 260 | 18 | 275 | 35 | 270 | 54 | 4 |
| 28-Aug | 1 | 0.85 | 11.2 | 14.0 | 16.6 | NA | NA | NA | 16 | 7 | 15.2 | 0 | 47.2 | 1 | 1.9 | 265 | 27 | 295 | 19 | 255 | 19 | 265 | 37 | 260 | 80 | 0 |
| 29-Aug | 2 | 0.83 | 11.2 | 13.6 | 16.2 | 9 | 5.5 | 28.0 | 23 | 8.8 | 22.3 | 451 | 54.3 | -3 | -2.3 | 255 | 29 | 275 | 19 | 250 | 16 | 250 | 38 | 235 | 53 | 2 |
| 30-Aug | 2 | 0.64 | 9.8 | 11.5 | 13.8 | 9.0 | 2.3 | 31.0 | 20 | 6 | 18.4 | 761 | 57.3 | -4 | -2.7 | 275 | 18 | 295 | 12 | 275 | 13 | 265 | 22 | 240 | 55 | 4 |
| 31-Aug | 1 | 0.52 | 9.5 | 11.2 | 13.2 | 9.9 | -1.1 | 26.1 | 19 | 4 | 17.8 | 312 | 56.2 | -2 | -1.6 | 300 | 30 | 330 | 20 | 305 | 20 | 300 | 30 | 305 | 45 | 2 |

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**September 2014**

| 2014 Date | Forecast CDC | Precipitable Water (inches) | 0°C Level (kft) | -5°C Level (kft) | -10°C Level (kft) | Cloud Base Height (kft) | Cloud Base Temp (°C) | Maximum Cloud Top Height (kft) | Temp. Maximum (°C) | Dew Point (°C) | Conv Temp (°C) | CAPE (J/kg) | Total Totals | Lifted Index | Showalter Index | Cell Direction (deg) | Cell Speed (knots) | Storm Direction (deg) | Storm Speed (knots) | Low Level Wind Direction (deg) | Low Level Wind Speed (kts) | Mid Level Wind Direction (deg) | Mid Level Wind Speed (knots) | High Level Wind Direction (deg) | High Level Wind Speed (knots) | Observed CDC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1-Sep | 2 | 0.65 | 9.5 | 11.6 | 13.9 | 8.5 | 3.0 | 28.0 | 19 | 7 | 18.5 | 601 | 55.2 | -3 | -1.2 | 295 | 30 | 325 | 20 | 290 | 20 | 295 | 30 | 305 | 95 | 2 |
| 2-Sep | 2 | 0.75 | 8.4 | 11.3 | 14.1 | 5.8 | 6.4 | 23.3 | 14.5 | 8.5 | 14.1 | 300 | 53.7 | -1.0 | -0.6 | 270 | 15 | 305 | 15 | 275 | 5 | 265 | 25 | 275 | 100 | 2 |
| 3-Sep | 1 | 0.55 | 8.3 | 10.9 | 13.6 | 7.1 | 3.7 | 23.5 | 13.5 | 6 | 12.5 | 275 | 55.1 | -1 | -1 | 15 | 20 | 35 | 15 | 15 | 20 | 5 | 15 | 285 | 5 | -1 |
| 4-Sep | -1 | 0.58 | 9.9 | 11.9 | 14.1 | 9.5 | 1.2 | 26.1 | 18 | 4.5 | 17.5 | 250 | 54.2 | -1 | -0.9 | 305 | 20 | 340 | 15 | 300 | 10 | 315 | 25 | 310 | 40 | -1 |
| 5-Sep | -3 | 0.72 | 11.2 | 14.2 | 17.3 | 9.7 | 2.5 | 11.1 | 22 | 7 | 24.7 | 0 | 45.2 | 2.0 | 3.3 | 315 | 30 | 340 | 20 | 305 | 25 | 315 | 40 | 330 | 45 | -2 |
| 6-Sep | -2 | 0.64 | 12.8 | 15.1 | 17.2 | 14.6 | -4.0 | 26.0 | 25 | 8 | 28 | 133 | 53 | -2.0 | -1.3 | 305 | 20 | 320 | 15 | 305 | 15 | 290 | 25 | 280 | 40 | -3 |
| 7-Sep | 4 | 0.93 | 11.2 | 13.6 | 16.3 | 9.2 | 5.6 | 39.0 | 24 | 10 | 21.5 | 1163 | 56.4 | -4.0 | -3.3 | 265 | 32 | 310 | 19 | 260 | 14 | 280 | 40 | 265 | 57 | 0 |
| 8-Sep | -2 | 0.57 | 4.1 | 9.9 | 14.6 | NA | NA | NA | 1 | -1.5 | 2.5 | 0 | 30.4 | 15.0 | 15.2 | 280 | 31 | 305 | 17 | 265 | 6 | 275 | 35 | 265 | 69 | -2 |
| 9-Sep | -2 | 0.39 | 5 | 7.6 | 10.7 | NA | NA | NA | 3.3 | 1.1 | 3.6 | 0 | 44.4 | 7 | 7.6 | 295 | 16 | 330 | 11 | 290 | 3 | 305 | 23 | 300 | 55 | -2 |
| 10-Sep | -2 | 0.32 | 4.8 | 6.7 | 8.9 | 6 | -4.5 | 11.5 | 3.1 | -1.9 | 3.4 | 20 | 48.9 | 5 | 5.8 | 15 | 11 | 65 | 5 | 35 | 12 | 50 | 3 | 335 | 31 | -1 |
| 11-Sep | -3 | 0.18 | 8.5 | 11.9 | 15.2 | NA | NA | NA | 10 | 1 | 18.7 | 0 | 36.7 | 9 | 10.0 | 5 | 17 | 30 | 10 | 335 | 9 | 10 | 24 | 360 | 37 | -3 |
| 12-Sep | -1 | 0.53 | 7.2 | 9.7 | 12.9 | 6.5 | 1.5 | 13.0 | 10 | 3.6 | 8.6 | 50 | 49.7 | 2.0 | 2.9 | 330 | 21 | 345 | 16 | 325 | 20 | 305 | 25 | 305 | 50 | -1 |
| 13-Sep | -1 | 0.40 | 8.2 | 10.8 | 14.3 | 8 | 0.3 | 11.2 | 13 | 2.8 | 12.3 | 16 | 48.2 | 3 | 3.1 | 325 | 19 | 350 | 15 | 305 | 17 | 325 | 29 | 335 | 75 | -1 |
| 14-Sep | -1 | 0.50 | 9.9 | 14.7 | 17.8 | 8.9 | 3 | 12.3 | 18 | 6 | 16.3 | 32 | 42.3 | 4 | 4.8 | 335 | 20 | 5 | 15 | 315 | 15 | 345 | 30 | 330 | 50 | -1 |
| 15-Sep | -3 | 0.57 | 13.4 | 16 | 18.4 | NA | NA | NA | 22 | 7.5 | 27.1 | 0 | 47.2 | 1.0 | 1.6 | 305 | 15 | 330 | 10 | 305 | 10 | 300 | 20 | 270 | 25 | -3 |
| Average | 0.6 | 0.8 | 11.3 | 13.8 | 16.5 | 8.9 | 5.6 | 30.0 | 20.9 | 9.3 | 20.7 | 635.2 | 52.6 | -1.9 | -1.0 | 250.6 | 17.3 | 262.4 | 11.4 | 253.7 | 12.5 | 258.8 | 20.8 | 260.6 | 41.1 | 0.8 |
| StdDev | 2.1 | 0.2 | 2.2 | 2.3 | 2.3 | 1.6 | 3.8 | 8.5 | 5.7 | 4.1 | 6.4 | 596.0 | 4.7 | 3.3 | 3.1 | 85.1 | 8.7 | 96.8 | 5.7 | 78.6 | 6.4 | 72.9 | 10.7 | 58.1 | 21.6 | 2.4 |
| Maximum | 4 | 1.3 | 15.6 | 18.3 | 20.7 | 14.6 | 12.6 | 41.5 | 31.0 | 17.0 | 32.6 | 2544 | 61.7 | 15.0 | 15.2 | 340 | 40 | 355 | 30 | 355 | 35 | 355 | 50 | 360 | 100 | 5 |
| Minimum | -3 | 0.2 | 4.1 | 6.7 | 8.9 | 5.2 | -4.7 | 11.1 | 1.0 | -1.9 | 2.5 | 0 | 30.4 | -8.0 | -6.9 | 5 | 1 | 0 | 0 | 15 | 0 | 5 | 3 | 40 | 5 | -3 |

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# APPENDIX J – Project Personnel and Telephone List

## ALBERTA HAIL SUPPRESSION PROJECT 2014

*Last Revised 9 June, 2014*

### ALBERTA SEVERE WEATHER MANAGEMENT SOCIETY (ASWMS) - CALGARY, ALBERTA

| | | | |
|---|---|---|---|
| **TODD KLAPAK** | ASWMS Board President<br>#1300-321 6th Ave. SW<br>Calgary, AB T2P 0P6 | Office: 403-231-1357<br>Fax: 403-233-2815 | todd.klapak@intact.net |
| **CATHERINE JANSSEN** | ASWMS Secretary-Treasurer | | janssenc@telus.net |
| **TERRY KRAUSS** | ASWMS Program Director<br>President, Krauss Weather Services, Inc.<br>79 Irving Crescent, Red Deer, AB T4R 3S3 | Cell: 403-318-0400 | twkrauss@gmail.com |

### WEATHER MODIFICATION, INC. (WMI) - FARGO, NORTH DAKOTA PHONE: 701-235-5500 FAX: 701-235-9717

| | | | |
|---|---|---|---|
| **BRUCE BOE** | Director of Meteorology Weather Modification, Inc.<br>3802 20th Street North, Fargo, ND 58102 | Office: 701-673-3354 | bboe@weathermodification.com |
| **HANS AHLNESS** | Vice President - Operations Weather Modification, Inc. | Direct Office: 701-373-8834 | hahlness@weathermodification.com |
| **ERIN FISCHER** | Admin Support Weather Modification, Inc. | Direct Office: 701-373-8829 | efischer@weathermodification.com |
| **DENNIS AFSETH** | Director of Electronics Weather Modification, Inc. | Office: 701-235-5500 ext 190/193 | dafseth@weathermodification.com |
| **TODD SCHULZ** | Electronics Technician Weather Modification, Inc. | Office: 701-235-5500 ext.191 | tm_schulz@yahoo.com |
| **MIKE CLANCY** | Director of Maintenance Weather Modification Inc. | Direct Office: 701-373-8841 | mclancy@fargojet.com |
| **RANDY JENSON** | CFO Weather Modification, Inc. | Office: 701-235-5500 ext. 103 | rjenson@weathermodification.com |
| **PATRICK SWEENEY** | President/CEO Weather Modification, Inc. | Office: 701-235-5500 ext.107 | pat@weathermodification.com |
| **JAMES SWEENEY** | Vice President Weather Modification, Inc. | Office: 701-235-5500 ext.102 | jim@weathermodification.com |

### RADAR OPERATIONS CENTER - OLDS-DIDSBURY AIRPORT, ALBERTA

**RADAR FAX: 403-335-8359 RADAR PHONE: 403-335-8359 ADDRESS: 1436, 320 Bergen Rd., Hangar 4, Didsbury, Alberta T0M 0W0 SHIPPING VIA FedEx/UPS: Weather Modification Inc. Olds-Didsbury Airport, Hangar 4, 1436 Twp Rd 320, Didsbury, AB T0M 0W0 EMAIL: olds@weathermodification.com**

| | | | |
|---|---|---|---|
| **DAN GILBERT** | Lead Meteorologist<br>Weather Modification, Inc. | | dgilbert@weathermodification.com |
| **BRAD WALLER** | Field Meteorologist<br>Weather Modification, Inc. | | bwaller@weathermodification.com |
| **ADAM BRAINARD** | Field Meteorologist<br>Weather Modification, Inc. | | adam.brainard@valpo.edu |

### PILOT OFFICE - CALGARY, ALBERTA

**PILOT OFFICE: 403-247-0001 ADDRESS: Springbank Aero Services, Inc. 208A Avro Lane, Calgary, Alberta T3Z 3S5 EMAIL: calgary@weathermodification.com**

| | | | |
|---|---|---|---|
| **JODY FISCHER** | Project Operations Manager | | jfischer@weathermodification.com |
| **JAKE MITCHEM** | Captain Weather Modification, Inc.<br>N904DK | | jrmitchem2k3@gmail.com |
| **TERRENCE LIN** | Co-Pilot Weather Modification, Inc.<br>N904DK | | vancouverwired@gmail.com |
| **JACOB EEUWES** | Co-Pilot Weather Modification, Inc.<br>N518TS | | jeeuwes@hotmail.com |
| **JENNY THORPE** | Captain Weather Modification, Inc.<br>N518TS | | jennythorpe@me.com |
| **ANDREW BRICE** | Captain Weather Modification, Inc.<br>N457DM | | andrewbrice89@gmail.com |
| **BRIAN KINDRAT** | Co- Pilot Weather Modification, Inc.<br>N457DM | | briankindrat@gmail.com |
| **ANDREAS BERTONI** | Co-Pilot Weather Modification, Inc. | | andreas.bertoni0205@gmail.com |

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| PILOT OFFICE - RED DEER, ALBERTA | | | |
|---|---|---|---|
| **PILOT OFFICE: 403-886-7857 ADDRESS: Hangar #2 Red Deer Ind Airport, Penhold, Alberta, T0M 1R0 EMAIL: reddeer@weathermodification.com** | | | |
| **ROGER TILBURY** | Captain Weather Modification, Inc.<br>**N522JP** | | rtilb34292@aol.com |
| **JOEL ZIMMER** | Co-Pilot Weather Modification, Inc.<br>**N522JP** | | pro_pilotage@hotmail.com |
| **MICHAEL TORRIS** | Co-Captain Weather Modification, Inc<br>N98585 | | metorris@gmail.com |
| **JENELLE NEWMAN** | Co-Captain Weather Modification, Inc<br>N98585 | | jenelle401@hotmail.com |
| **ADDITIONAL SUPPORT SERVICES** | | | |
| **SPRINGBANK FUEL TRUCK afterhours** | | Phone: 403-466-8834 | |
| **AIR SPRAY - PERRY DANCAUSE** | Director of Flight Ops and Administration | Phone: 403-886-4088 Ext.102 Fax: 403-886-2650 | |
| **ATC EDMONTON OSS** | Notification to Launch Aircraft | Phone: 888-882-2254 | |
| **ATC SHIFT MANAGER EDMONTON** | | Phone: 780-890-8397 Fax: 780-890-4710 | |
| **ATC CALGARY TERMINAL SUPERVISOR** | | Phone: 780-890-4711 | |
| **ATC CALGARY TOWER** | | Phone: 403-216-7121 Fax: 403-216-7122 | |
| **Calgary International Airport** | Duty Manager Desk | Phone: 403-735-1200 | |
| **STORM WATCH HOTLINE** | Severe Weather Desk: 800.239.0484 | Phone: 800-66-STORM (800-667-8676) | |
| **RED DEER AIRPORT FLIGHT SERVICE** | | Phone: 403-886-4547 | |
| **SKY WINGS (DENNIS COOPER)** | Red Deer Fuel (JET-A) | Phone: 403-886-5191 | |
| **HILLMAN AIR LTD (GARY HILLMAN)** | Red Deer Fuel (100LL) | Phone: 403-886-4187 Cell: 403-597-4187 | |
| **Barry Robinson** | Radar Technician Cell: 403-877-5853 | | |
| **Dave Civil (COMTEL Electric Ltd.)** | Radar Technician Cell: 403-333-2152 | | comtelelectric@yahoo.com |

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**NOTICE OF INTENT TO ENGAGE IN WEATHER MODIFICATION ACTIVITIES**
PURSUANT TO THE WEATHER MODIFICATION INFORMATION ACT AND REGULATIONS
SCHEDULE I

## PART 1. GENERAL IDENTIFICATION OF ACTIVITY

Date of notice: May 18, 2015
Proposed starting date: June 1st, 2015
Expected duration: September 15th, 2015

Province and area to be affected: Central Alberta, covering the Red Deer to Calgary regions (see attached map showing project area which has remained the same since 1996).

Weather elements to be modified: Thunderstorms
Modification expected: Hail Suppression
Class of operation: Operational
Operating method: airborne
Class of economy to benefit: insurance industry: private and public property primary, agriculture secondary.

## PART 2. GENERAL INFORMATION CONCERNING WEATHER MODIFIER

Organization name: Weather Modification Inc. (WMI)
http://www.weathermodification.com/

Parent Organization: Weather Modification Inc. (WMI)
3802 20th Street North
Fargo, ND USA 58102

Chief Officer: Mr. Patrick H. Sweeney, President Tel: (701) 235-5500
pat@weathermod.com

Local Organization: Weather Modification, Inc. Tel. (403) 335-8359
Olds-Didsbury Airport, Highway 2A
Olds, AB T4H 1A1

Name and relevant qualifications of officer(s) designated in charge of project:

Chief Officer: Mr. Daniel Gilbert, Chief Meteorologist
B.S., 12 years' experience
WMA Certified Weather Modification Operator #78
Office Tel: (403) 335-8359
(see Part 5 for details of qualifications and experience)

Vice President - Meteorology Mr. Bruce Boe
Project Manager/Meteorology, 41 years' experience
Tel: (701) 235-5500

Primary activities of organization (see web page at www.weathermodification.com):
- cloud seeding
- atmospheric research
- air pollution monitoring
- meteorological radar monitoring
- equipment design and fabrication
- aircraft modifications

Amount of public liability insurance carried applicable to activity: CAD$50 million by the Alberta Severe Weather Management Society and US$5 million by Weather Modification, Inc.

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List of similar weather modification activities previously undertaken:

a. Canada: The Alberta Hail Project has been operating in its present form since 1996. The contractor (operator) for this entire period has been WMI.

b. Elsewhere:
- WMI has conducted the hail suppression cloud seeding in North Dakota for more than 50 years. This is an ongoing project.
- WMI conducted hail suppression in Mendoza, Argentina using 3 to 4 Cheyenne II aircraft and a Lear Jet 1998-2004.
- WMI conducted operational cloud seeding in Oklahoma for Rain Enhancement and Hail Suppression 1997-2001.
- WMI has conducted operational cloud seeding in Alberta, Burkina Faso, California, Idaho, Mexico, UAE, India, Indonesia, Mali, Nevada, North Dakota, Saudi Arabia, Senegal, and Wyoming within the last 10 years.

4. References:

1. Dr. Terry Krauss
Krauss Weather Services
79 Irving Crescent
Red Deer, AB T4R 3S3 Tel. 403-318-0400

2. Mr. Darin Langerud, Director
State of North Dakota Atmospheric Resource Board
900 E. Boulevard Ave.
Bismarck, ND 58505 Tel. 701-328-2788

3. Mr. James Renick
Alberta Severe Weather Management Society (ret.)
11 Warwick Drive
Red Deer, AB T4N 6L4 Tel. 403-347-1545

4. Dr. Paul L. Smith
South Dakota School of Mines & Technology
501 E. St. Joseph Street
Rapid City, SD 57701-3995 Tel. 605-394-2291

List of subcontractors: WMI owns and operates its own fleet of aircraft and weather radars. No major sub-contractors are being used on the Alberta Hail project for aircraft or radar services. Solution Blend Services, Calgary, Alberta (403) 207-9840 will be handling and mixing seeding solutions for the project.

## PART 3. GENERAL INFORMATION CONCERNING ORGANIZATION FOR WHOM ACTIVITY IS TO BE CONDUCTED.

Name of organization: Alberta Severe Weather Management Society (ASWMS)

Chief officers: Mr. Todd Klapak, President
todd.klapak@intact.net
Ms. Catherine Janssen, Secretary-Treasurer
janssenc@telus.net

Nature of organization: A not-for-profit society of the property and casualty insurers and brokers operating in Alberta. The society was formed for the purpose of collecting funds from its members to operate a hail suppression program to help reduce insurance payout due to hail and stabilize insurance rates throughout the province.

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## PART 4. GENERAL INFORMATION CONCERNING FIELD BASES OF ACTIVITY

Address and location of project primary field base:
Olds-Didsbury Airport, Alberta. tel. 403-335-8359
Address(es) and locations(s) of project secondary field base(s):

- Springbank airport tel. 403-247-0001
- Red Deer industrial airport tel. 403-886-7857

## PART 5. GENERAL INFORMATION CONCERNING OPERATING FIELD PERSONNEL

Name and title of field officer in charge: Mr. Daniel Gilbert, Chief Meteorologist
Old-Didsbury Airport, Highway 2A
Olds, AB T4H 1A1

tel. & fax. 403-335-8359,
e-mail: dgilbert@weathermodifcation.com
home page: http://www.weathermodification.com/

Qualifications of field officer in charge (Gilbert):

Education
Bachelor of Science, Meteorology and Environmental Studies (double major) May 2004, Iowa State University, Ames, IA
Associate of Arts, Liberal Arts, May 2000, Iowa Central Community College, Fort Dodge, IA

Weather Modification Experience
Chief Meteorologist, Weather Modification, Inc. (Wyoming and Alberta) - November 2009 to present
Forecaster, radar operator, rawinsondes, direction of seeding aircraft. Case declarations, wintertime (Wyoming) research program.
Meteorologist, RHS Consulting (Fresno, CA) – November 2008-February 2009
Directed airborne and ground based cloud seeding operations over portions of the central and southern Sierra Nevada Mountains. Set up and performed routine maintenance of ground based ice nucleus generators. Provided daily forecasts for clients and project personnel.
Meteorologist, Independent Contractor, (Boise, ID) – October 2007 to April 2008
Provided meteorological services to support Idaho Power Company's winter cloud seeding project in West Central Idaho, directed airborne and ground seeding operations, directed rawinsonde releases, provided short-term operational forecasts and nowcasts for pilots, communicated with aircraft via two-way radio
Field Meteorologist, North Dakota Cloud Modification Project, (Stanley or Bowman, ND) – Summers, 2003-2009
Operated 5 cm weather radar equipped with TITAN software package, launched and directed seeding aircraft using two-way radio and GPS tracking, performed data recording and documentation of cloud seeding operations, prepared silver iodide seeding solution, assisted with radar calibrations, prepared forecasts and briefed pilots daily, supervised intern meteorologists, presented case studies for ground school, operated cloud condensation nuclei counter for joint research with South Dakota School of Mines
Forecaster, Atmospherics Incorporated, (Fresno, CA) - October 2006 - May 2007
Field Meteorologist, Atmospherics, Inc. (Modesto, CA) - November 2005 - April 2006
Field Meteorologist, Atmospherics, Inc. (Paso Robles, CA) - December 2004 - February 2005
Provided daily forecasts for seeding operations and/or clients, operated 5cm weather radar, directed winter cloud seeding operations over the Sierra Nevada utilizing both glaciogenic and hygroscopic seeding agents, traced radar overlays, performed data recording of operations, wrote monthly and annual reports

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Memberships and Honors

- Meteorologist Distinguished Service Award, 2013, Weather Modification Association
- Member, Weather Modification Association (certified operator #78)
- Member, American Meteorological Society
- Iowa Central Community College Honor Society, inducted April 27, 2000
- Wilbur E Brewer Professionalism Award, 2007 North Dakota Cloud Modification Project

Field Address: Olds-Didsbury Airport, Highway 2A, Olds, AB
Field Telephone no. 403-335-8359
Field personnel: full time = 3
part time = 12

Daily records of activities: Custodian = Ms. Erin Fischer
WMI Project Operations Centre
Olds-Didsbury Airport, Highway 2A, AB T4H 1A1

All records are maintained June 1st -Sept. 15th annually.

- daily weather synopsis and forecast report
- radar echo storm data report and maps
- daily operations summary report
- chemical inventory report
- equipment status report
- aircraft flight track maps
- flight log report
- project aircraft maintenance report

## PART 6. GENERAL INFORMATION CONCERNING PROPOSED ACTIVITY

Reasons for organization seeking modified weather: The hailstorm on Sept. 7, 1991 caused >$400 million damage in the City of Calgary alone. Hailstorms in the City of Calgary caused >$500 Million in 2010 and again in 2012. In addition, hailstorms have caused >$100 Million damage to crops annually since 2007 and the damage to crops was >$400 Million in 2012. Hailstorms have now become a billion dollar problem to the economy of Alberta. The 20 largest insurance companies and their affiliates have banded together to conduct hail suppression operations in the "hail alley" of central Alberta to combat urban hail damage in the Calgary to Red Deer area. The current program has conducted cloud-seeding operations in central Alberta each summer since 1996.

Specific modification sought: Diminish hail damage to property in central Alberta with special priority given to the urban areas of Calgary and Red Deer.

Quantitative estimate of modification expected: Even very small positive results (+1%) will be economically beneficial, however, it is hoped that reductions in damage on the order of 25% or greater will be realized. The insurance industry has been encouraged by the results, estimating a savings of several hundred-million dollars to the industry, paying out approximately 50% of what they expected.

Secondary effects anticipated: Reductions in crop damage due to hail should also be realized. Seeding may also provide an increase in precipitation according to recent analyses of radar data. The crop hail insurance data for the first 10 years of the project indicated a reduction in the loss-to-risk values compared with the historical 58 year average for the province as a whole. However, a recent analysis shows increased variability and an increasing trend in hail damage over the last 5 years both inside and outside the project area which is likely due to climate change. The effect of the seeding on crop damage is inconclusive at this time.

Geographic area affected (see attached map): The main project area is from Calgary to Red Deer,

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Alberta and west to the foothills of the Rocky Mountains.

Estimate of adjoining geographic area possibly affected: Areas downwind (east) of highway no. 2 to highway no. 21 may also benefit from the seeded storms.
Approximate total cost: approx. $3.1 million per year.

Funds to be expended in Canada: est. $600,000 per year.

General period of operation: June 1st - Sept. 15th annually.

## PART 7. GENERAL INFORMATION CONCERNING OPERATIONS AND TECHNIQUES

A. GENERAL: The following text describes the methods to be used, general principles of techniques, description of specific techniques, and a brief description of typical operations:

OVERVIEW OF METHOD

For hail suppression, aircraft patrolling based upon forecasts and hourly weather reports will be used to initiate seeding as soon as appropriate conditions develop. Storms will be seeded if they have radar reflectivities of approximately 35 dBZ at heights above the -5°C temperature level, and are considered to be a potential hail threat to an urban or populated area. When large hail is forecast, seeding will commence when radar reflectivities reach approximately 20 dBZ in order to start the microphysical suppression process as early as possible within the potential hailstorms. Storms will be seeded by aircraft using either droppable AgI pyrotechnics and/or wing mounted AgI pyrotechnics or AgI-solution burners.

The amount of seeding material used will depend upon the lifetime and size of the cloud or storm and other meteorological conditions. The seeding rates are about double those used during the 1970's and 1980's in Alberta. Seeding will be focused on the feeder clouds of the storm's new growth zone and will be conducted at cloud top and cloud base. Further details of the seeding method are discussed below.

HAIL SUPPRESSION HYPOTHESIS

The cloud seeding hypothesis is based on the cloud microphysics concept of "beneficial competition". Beneficial competition assumes a lack of natural ice nuclei in the environment effective at temperatures warmer than -20°C and that the injection of AgI will result in the production of a significant number of "artificial" ice nuclei. The natural and artificial ice crystals "compete" for the available supercooled liquid cloud water within the storm. Hence, the hailstones that are formed within the seeded cloud volumes will be smaller and produce less damage if they should survive the fall to the surface. If enough nuclei are introduced into the new growth region of the storm, then it is possible that the hailstones will be small enough to melt completely before reaching the ground.

Cloud seeding operations are intended to alter the cloud microphysics of the treated clouds, assuming that the present precipitation process is inefficient due to a lack of natural ice nuclei. The seeding is based on a conceptual model of Alberta hailstorms that evolved from the studies of Chisholm (1970), Chisholm and Renick (1972), Barge and Bergwall (1976), Krauss and Marwitz (1984), English and Krauss (1986) and English (1986).

It is assumed that hail embryos grow within the time evolving "main" updraft of single cell storms and within the updrafts of developing "feeder clouds" or cumulus towers that flank mature "multi-cell" and "super-cell" storms (see e.g. Foote 1984). The growth to large hail is hypothesized to occur along the edges of the main storm updraft where the merging feeder clouds interact with the main storm updraft.

For hail suppression, seeding with a large amount of silver-iodide will dramatically increase the ice crystal concentration in thunderstorm clouds and compete for the available supercooled cloud water to prevent the growth of large, damaging, ice particles. Based on WMI's experience, the cloud seeding will be targeted on the feeder cloud updraft regions associated with the production of hail and will leave

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unseeded those regions of the storm associated with the production of rain only. This will make efficient use of the seeding material (AgI) and will reduce the possible risk of overseeding rain clouds.

CLOUD SEEDING METHODOLOGY - SEEDING TECHNIQUES

Convective cells (defined by radar) with maximum reflectivity approximately >35 dBZ within the cloud layer above the -5°C level, located within the project areas or within a 20 min travel time "buffer zone" upwind of the project area, will be seeded if they pose a potential threat of damaging hail for an urban or populated area. Radar observers/controllers will be responsible for making the "seed" decision and directing the cloud seeding missions.

Patrol flights will be launched before clouds within the target area meet the radar reflectivity seeding criteria. These patrol flights are meant to provide immediate response to developing cells. In general, a patrol is launched in the event of visual reports of vigorous towering cumulus clouds near Calgary or Red Deer, or when radar cells exceed 25 kft height over the higher terrain along the western border and begin moving towards the urban areas.

Launches of more than one aircraft are determined by the number of storms in each area, the lead time required for a seeder aircraft to reach the proper location and altitude, and projected overlap of coverage and on-station time for multiple aircraft missions. In general, only one aircraft can work safely at cloud top and one aircraft at cloud base for a single storm. The operation of three aircraft is recommended to provide uninterrupted seeding coverage at either cloud-base or cloud-top and to seed three storms simultaneously if required.

The program is designed to seed convective clouds, before they achieve radar reflectivities associated with hail, and deliver seeding material to regions of updraft and supercooled liquid water i.e. the primary conditions responsible for the growth of hailstones.

Factors that determine cloud top or cloud base seeding are: storm structure, visibility, cloud base height, or time available to reach seeding altitude. Cloud base seeding is conducted by flying at cloud base within the main inflow of single cell storms, or the inflow associated with the new growth zone (shelf cloud) located on the upshear side of multi-cell storms.

Cloud top seeding is conducted between typically between -5°C and -10°C. The pencil flares fall approximately 1.5 km (approximately 10°C) during their 35-40 second burn time. The seeding aircraft will penetrate the edges of single convective cells meeting the seed criteria. For multi-cell storms, or storms with feeder clouds, the seeding aircraft will penetrate the tops of the developing cumulus towers on the upshear sides of convective cells, as they grow up through the aircraft's altitude.

Occasionally, with embedded cells or convective complexes, there are no clearly defined feeder turrets visible to the flight crews or on radar. In these instances, at an altitude between -5°C and - 10°C, a seeding aircraft will penetrate the storm edge (region of tight radar reflectivity gradient) on the upshear side and burn a burn-in-place flare and inject droppable pencil flares when updrafts are encountered.

Seeding is effective only within cloud updrafts and in the presence of supercooled cloud water, i.e. the developing, and mature stages in the evolution of the classic thunderstorm conceptual model. The dissipative stages of a storm would be seeded only if the maximum reflectivity is particularly severe and there is evidence (visual cloud growth, or tight reflectivity gradients) indicating the possible presence of embedded updrafts.

SEEDING RATE

A seeding rate of one 20 g flare every 5 s is typically used during cloud penetration. A slightly higher rate is used (e.g. 1 flare every 2 s) if updrafts are very strong (e.g. > 2000 ft/min) and the storm is particularly intense. Calculations show that this seeding rate will produce >1300 ice crystals per litre which is more than sufficient to deplete the liquid water content produced by updrafts of 10 m/s (2000 ft/min), thereby preventing the growth of hailstones within the seeded cloud volumes.

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A cloud seeding pass is repeated immediately if there are visual signs of new cloud growth or radar reflectivity gradients remain tight (indicative of persistent updrafts). A 5 to 10 min waiting period may be used, to allow for the seeding material to take effect and the storm to dissipate, if visual signs of glaciation appear or radar reflectivity values decrease and gradients weaken. This waiting period precludes the waste of seeding material and ensures its optimum usage.

For cloud base seeding, a typical seeding rate of 1 burn-in-place flare (150 g each) is used. Cloud seeding runs are repeated until no further inflow is found. Acetone burners will also be used to provide continuous silver iodide seeding if extensive regions of weak updraft are observed at cloud base and the shelf cloud region. Base seeding is not conducted if only downdrafts are encountered at cloud base, since this would waste seeding material.

The cloud seeding flares are silver-iodide pyrotechnics with an ice nuclei effectiveness of approximately $10^{14}$ nuclei per gram of pyrotechnic, active at -10°C, as determined by independent cloud chamber tests at Colorado State University.

Sufficient dispersion of the particles is required for AgI plume overlap from consecutive flares by the time the cloud particles reach hail size for effective hail suppression. The work by Grandia et al. (1979) based on turbulence measurements within Alberta feeder clouds indicated that the time for the diameter of the diffusing line of AgI to reach the integral length scale (200 m) in the inertial subrange size scales of mixing, was 140 seconds. This is insufficient time for ice particles to grow to hail size. Therefore, dropping flares at 5 sec intervals should effectively deplete the supercooled liquid water and prevent the growth of hail particles. The use of the 20 gram flares and a frequent drop rate provides better seeding coverage than using larger flares with greater time/distance spacing between flare drops. In fact, the above calculations are conservative when one considers that the center of the ice crystal plume center will have a higher concentration of crystals.

## B. EQUIPMENT

Type:

- one Advanced Radar Corporation C-band Doppler weather radar, 250 kw peak power, with 1.65 deg. beam width, located at the Olds-Didsbury airport, 50ft tower mounted including radome.
- Three Beechcraft C90 King-Air prop-jet aircraft (two in Springbank and one in Red Deer).
- Two Cessna 340 aircraft (one in Springbank and one in Red Deer).

## C. MATERIALS TO BE EMITTED:

- Cloud top (ejectable) pyrotechnic flares are 20g AgI formulation manufactured by Ice Crystal Engineering (ICE) of Kindred, North Dakota, USA (www.iceflares.com)
- Cloud base (burn-in-place) flares are 150g AgI formulation manufactured by Ice Crystal Engineering (ICE) of Kindred, North Dakota, USA (www.iceflares.com)
- A solution of acetone, silver iodide, sodium perchlorate, paradichlorobenzene, and ammonium iodide will also be burned for continuous seeding at cloud base. The products of combustion yield silver iodide (AgI) ice nuclei, carbon dioxide ($CO_2$), and water ($H_2O$).

Activation tests performed at Colorado State University indicate greater than$10^{14}$ ice crystals per gram of seeding agent burned, active at -10°C.

Total flight hours and quantities to be dispersed: We estimate the project may use 5000 twenty-gram flares and 500 one hundred-fifty gram flares, plus approximately 150 gallons of the seeding solution (2% AgI by volume) will be burned. The number of operational days, flights, and amount of seeding material dispensed over the past fifteen years is summarized in the attached table. No harmful effects from these materials is expected. This is based on years of studies (both in the USA and Canada) to detect silver in

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precipitation (above background levels) following cloud seeding. The amount of silver distributed by the cloud seeding is small compared to the output from industry. Silver amounts from cloud seeding are far, far less than the USA EPA guidelines.

## PART 8. GENERAL INFORMATION CONCERNING USE OF AIRCRAFT.

- Three C90 King Air prop-jet aircraft, two in Springbank (N904DK and N518TS) and one based in Red Deer (N522JP).
- Two Cessna 340 aircraft, one in Springbank (N457DM) and one in Red Deer (N37356).

## PART 9. GENERAL INFORMATION CONCERNING USE OF GROUND VEHICLES.

No special project ground vehicles will be used on the project. (Only private vehicles for personal transportation will be used.)

## PART 10. GENERAL INFORMATION CONCERNING ANY MEASUREMENTS OR OBSERVATION INSTRUMENTATION.

No special surface observations are planned for this project. The primary instrumentation is the weather radar and special aircraft instrumentation. Daily weather charts will be recorded for documentation and reporting purposes.

AIRCRAFT TRACKING GLOBAL POSITIONING SYSTEM (GPS): The WMI weather radar control and communications center will be equipped to receive and record data from the GPS aircraft tracking system. The GPS system displays the exact position of aircraft superimposed on the radar display to enable the controller to accurately direct the seeding aircraft to optimum seeding locations within the storm system. The color-coded aircraft position on the PPI will be marked with a small symbol. Electronic coding will enable radar controllers to discriminate between all project aircraft.

TEMPERATURE INSTRUMENTATION: Each of the cloud seeding aircraft will have a temperature sensor to ensure that the cloud penetration seeding runs are conducted at the proper temperature levels.

WEATHER RADAR: The C-band radar will be equipped with a computerized radar recording and display system. The radar recording system will be capable of providing numerous cell statistics and colour products including plots of radar PPI displays and maximum reflectivity maps. The sophisticated radar tracking software called TITAN (Thunderstorm Identification, Tracking, Analysis, and Nowcasting) has been used since 1997 and has proved to be very useful. TITAN is licensed from NCAR.

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**PART 11. CERTIFICATION BY ORGANIZATION FOR WHOM ACTIVITY IS TO BE CONDUCTED:**

State type of working agreement entered into with the weather modifier: Contract.

I HEREBY CERTIFY THAT ALL STATEMENTS MADE IN THIS NOTIFICATION OF INTENT TO ENGAGE IN WEATHER MODIFICATION ACTIVITIES ARE TRUE AND COMPLETE TO THE BEST OF MY KNOWLEDGE, AND REPRESENT IN SUBSTANCE AN ACCURATE DESCRIPTION OF A PROPOSAL TO UNDERTAKE WEATHER MODIFICATION ACTIVITIES ON BEHALF OF THE ORGANIZATION NAMED HEREIN.

Name of organization: Alberta Severe Weather Management Society

Full name of certifying officer and title:

Todd Klapak
President, Alberta Severe Weather Management Society
(403) 231-1357, Todd.Klapak@intact.net

Signature:  Date: May 18, 2015

**PART 12. CERTIFICATION BY PERSON PROPOSING TO CONDUCT ACTIVITY.**

I HEREBY CERTIFY THAT INFORMATION PROVIDED IN THIS NOTIFICATION OF INTENT TO ENGAGE IN WEATHER MODIFICATION ACTIVITIES IS A TRUE AND COMPLETE DESCRIPTION OF MY PROPOSED PLANS TO ENGAGE IN THE SPECIFIC WEATHER MODIFICATION ACTIVITIES HEREIN DESCRIBED.

Name of organization: Weather Modification, Inc.

Full name of certifying officer:
Bruce A. Boe
Vice President of Meteorology
(701) 235-5500

Signature: Date: May 18, 2015

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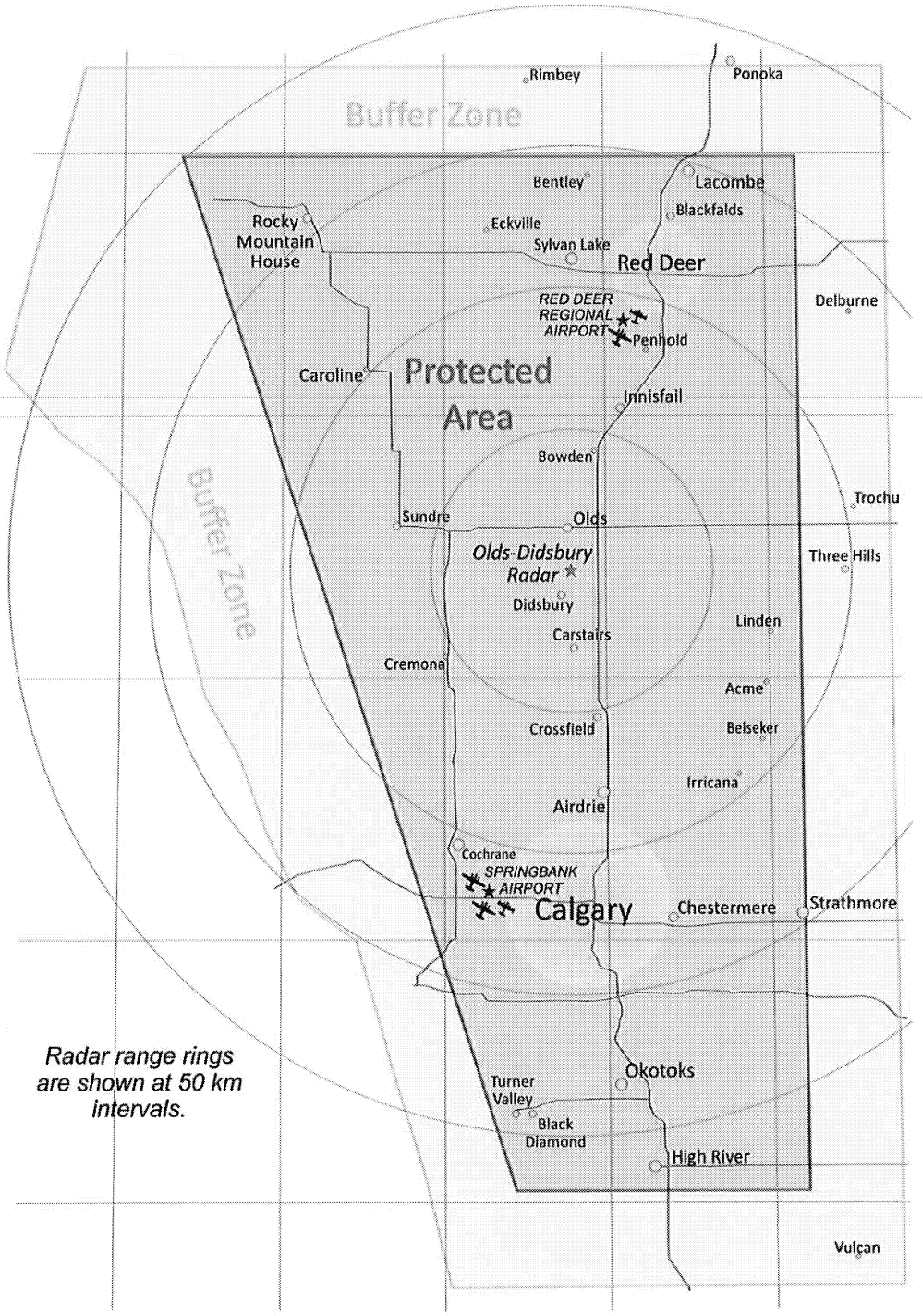


**Figure 1: Map of south-central Alberta showing the project area, outlined in green, covered by the Hail Suppression activities.**

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***Table 1: Operational Statistics for 1996 to 2014.***

| Seeding Activity by Season | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Season** | **Storm Days With Seeding** | **Aircraft Missions (Seeding & Patrol)** | **Total Flight Time (hours)** | **Number of Storms Seeded** | **Total Seeding Agent (kg)** | **Seeding Agent Per Day (kg)** | **Seeding Agent Per Hour (kg)** | **Seeding Agent Per Storm (kg)** | **Ejectable Flares** | **Burn-in-place Flares** | **Seeding Solutions (gallons)** | **Season Activity Rank** |
| **2014** | 32 | 128 | 259.5 | 101 | 382.5 | 12.0 | 1.47 | 3.79 | 10782 | 1020 | 228.6 | 3 |
| **Mean** | 31.2 | 102.6 | 211.7 | 92.4 | 207.6 | 6.5 | 1.00 | 2.32 | 5024.5 | 641.4 | 157.3 | |
| **2013** | 26 | 103 | 229.6 | 70 | 233.3 | 9.0 | 1.02 | 3.33 | 6311 | 636 | 131.7 | 10 |
| **2012** | 37 | 143 | 300.1 | 116 | 314.6 | 8.5 | 1.16 | 2.70 | 7717 | 914 | 260.3 | 2 |
| **2011** | 48 | 158 | 383.0 | 134 | 400.1 | 8.3 | 1.13 | 3.00 | 10779 | 1020 | 350.2 | 1 |
| **2010** | 42 | 115 | 271.8 | 118 | 263.8 | 6.3 | 1.10 | 2.20 | 5837 | 851 | 227.5 | 6 |
| **2009** | 20 | 38 | 109.3 | 30 | 48.4 | 2.4 | 0.84 | 1.60 | 451 | 237 | 56.5 | 19 |
| **2008** | 26 | 112 | 194.7 | 56 | 122.9 | 4.7 | 1.00 | 2.20 | 1648 | 548 | 113.5 | 14 |
| **2007** | 19 | 76 | 115.3 | 41 | 99.7 | 5.2 | 0.90 | 2.40 | 1622 | 413 | 77 | 18 |
| **2006** | 28 | 92 | 190.2 | 65 | 214 | 7.6 | 1.10 | 3.30 | 4929 | 703 | 145.4 | 11 |
| **2005** | 27 | 80 | 157.9 | 70 | 159.1 | 5.9 | 1.00 | 2.30 | 3770 | 515 | 94.2 | 15 |
| **2004** | 29 | 105 | 227.5 | 90 | 270.9 | 9.3 | 1.20 | 3.00 | 6513 | 877 | 132.7 | 7 |
| **2003** | 26 | 92 | 163.6 | 79 | 173.4 | 6.7 | 1.10 | 2.20 | 4465 | 518 | 92.6 | 13 |
| **2002** | 27 | 92 | 157.4 | 54 | 124.2 | 4.6 | 0.80 | 2.30 | 3108 | 377 | 80.3 | 17 |
| **2001** | 36 | 109 | 208.3 | 98 | 195 | 5.4 | 0.90 | 2.00 | 5225 | 533 | 140.8 | 8 |
| **2000** | 33 | 130 | 265.2 | 136 | 343.8 | 10.4 | 1.30 | 2.50 | 9653 | 940 | 141.3 | 4 |
| **1999** | 39 | 118 | 251.3 | 162 | 212.7 | 5.5 | 0.80 | 1.30 | 4439 | 690 | 297.5 | 5 |
| **1998** | 31 | 96 | 189.9 | 153 | 111.1 | 3.6 | 0.60 | 0.70 | 2023 | 496 | 193.8 | 9 |
| **1997*** | 38 | 92 | 188.1 | 108 | 110.8 | 2.9 | 0.60 | 1.00 | 2376 | 356 | 144.3 | 12 |
| **1996*** | 29 | 71 | 159.1 | 75 | 163.3 | 5.6 | 1.00 | 2.20 | 3817 | 542 | 80.5 | 16 |
| **The 1996 and 1997 seasons began on June 15, not June 1, which has been the norm ever since.* | | | | | | | | | | | | |

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# NOTICE OF INTENT TO ENGAGE IN WEATHER MODIFICATION ACTIVITIES
PURSUANT TO THE WEATHER MODIFICATION INFORMATION ACT AND REGULATIONS
SCHEDULE I

## PART 1. GENERAL IDENTIFICATION OF ACTIVITY

| | |
|---|---|
| Date of notice: | May 9, 2013 |
| Proposed starting date: | June 1st, 2013 |
| Expected duration: | September 15th, 2013 |
| Province and area to be affected: | Central Alberta, covering the Red Deer to Calgary regions (see attached map showing project area which has remained the same since 1996). |
| Weather elements to be modified: | Thunderstorms |
| Modification expected: | Hail Suppression |
| Class of operation: | Operational |
| Operating method: | Airborne |
| Class of economy to benefit: | Insurance Industry: private and public property primary, agriculture secondary. |

## PART 2. GENERAL INFORMATION CONCERNING WEATHER MODIFIER

| | | |
|---|---|---|
| Organization name: | Weather Modification Inc. (WMI)<br>http://www.weathermodification.com/ | |
| Parent Organization: | Weather Modification Inc. (WMI)<br>3802 20th Street North<br>Fargo, ND USA 58102 | |
| Chief Officer: | Mr. Patrick H. Sweeney, President<br>pat@weathermod.com | Tel: (701) 235-5500 |
| Local Organization: | Weather Modification, Inc.<br>Olds-Didsbury Airport, Highway 2A<br>Olds, AB T4H 1A1 | Tel. (403) 335-8359 |

Name and relevant qualifications of officer(s) designated in charge of project:

| | |
|---|---|
| Chief Officer: | Mr. Daniel Gilbert, Chief Meteorologist<br>B.S., 10 years' experience<br>WMA Certified Weather Modification Operator #78<br>Office Tel: (403) 335-8359<br>(see Part 5 for details of qualifications and experience) |
| Director of Meteorology | Mr. Bruce Boe<br>Project Manager/Meteorology, 39 years' experience<br>Tel: (701) 235-5500 |

Primary activities of organization (see web page at www.weathermodification.com):

- cloud seeding
- atmospheric research
- air pollution monitoring
- meteorological radar monitoring
- equipment design and fabrication
- aircraft modifications

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Amount of public liability insurance carried applicable to activity: CAD$50 million by the Alberta Severe Weather Management Society and US$5 million by Weather Modification, Inc.

List of similar weather modification activities previously undertaken:

a. Canada: The Alberta Hail Project has been operating in its present form since 1996. The contractor (operator) for this entire period has been WMI.

b. Elsewhere:
- WMI has conducted the hail suppression cloud seeding in North Dakota for more than 50 years. This is an ongoing project.
- WMI conducted hail suppression in Mendoza, Argentina using 3 to 4 Cheyenne II aircraft and a Lear Jet 1998-2004.
- WMI conducted operational cloud seeding in Oklahoma for Rain Enhancement and Hail Suppression 1997-2001.
- WMI has conducted operational cloud seeding in Alberta, Burkina Faso, California, California, Idaho, Mexico, UAE, India, Indonesia, Mali, Nevada, North Dakota, Saudi Arabia, Senegal, and Wyoming within the last 10 years.

4. References:

1. Dr. Terry Krauss
   Krauss Weather Services
   79 Irving Crescent
   Red Deer, AB T4R 3S3 Tel. 403-318-0400
2. Mr. Darin Langerud, Director
   State of North Dakota Atmospheric Resource Board
   900 E. Boulevard Ave.
   Bismarck, ND 58505 Tel. 701-328-2788
3. Mr. James Renick
   Alberta Severe Weather Management Society (ret.)
   11 Warwick Drive
   Red Deer, AB T4N 6L4 Tel. 403-347-1545
4. Dr. Paul L. Smith, Director
   Institute of Atmospheric Sciences
   South Dakota School of Mines & Technology
   501 E. St. Joseph Street
   Rapid City, SD 57701-3995 Tel. 605-394-2291

List of subcontractors: WMI owns and operates its own fleet of aircraft and weather radars. No major sub-contractors are being used on the Alberta Hail project for aircraft or radar services. Solution Blend Services, Calgary, Alberta (403) 207-9840 will be handling and mixing seeding solutions for the project.

## PART 3. GENERAL INFORMATION CONCERNING ORGANIZATION FOR WHOM ACTIVITY IS TO BE CONDUCTED.

Name of organization: Alberta Severe Weather Management Society (ASWMS)

Chief officers: Mr. Todd Klapak, President
todd.klapak@intact.net
Ms. Catherine Janssen, Secretary-Treasurer
janssenc@telus.net

Nature of organization: A not-for-profit society of the property and casualty insurers and brokers operating in Alberta. The society was formed for the purpose of collecting funds from its members to operate a hail suppression program to help reduce insurance payout due to hail and stabilize insurance rates throughout the province.

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## PART 4. GENERAL INFORMATION CONCERNING FIELD BASES OF ACTIVITY

Address and location of project primary field base:

- Olds-Didsbury Airport, Alberta tel. 403-335-8359

Address(es) and locations(s) of project secondary field base(s):

- Springbank airport tel. 403-247-0001
- Red Deer industrial airport tel. 403-886-7857

## PART 5. GENERAL INFORMATION CONCERNING OPERATING FIELD PERSONNEL

Name and title of field officer in charge: Mr. Daniel Gilbert, Chief Meteorologist
Old-Didsbury Airport, Highway 2A
Olds, AB T4H 1A1

tel. & fax: 403-335-8359,
e-mail: dgilbert@weathermodifcation.com
home page: http://www.weathermodification.com/

Qualifications of field officer in charge (Gilbert):

Education
Bachelor of Science, Meteorology and Environmental Studies (double major) May 2004, Iowa State University, Ames, IA
Associate of Arts, Liberal Arts, May 2000, Iowa Central Community College, Fort Dodge, IA

Weather Modification Experience
Chief Meteorologist, Weather Modification, Inc. (Wyoming and Alberta) - November 2009 to present
Forecaster, radar operator, rawinsondes, direction of seeding aircraft. Case declarations, wintertime (Wyoming) research program.
Meteorologist, RHS Consulting (Fresno, CA) – November 2008-February 2009
Directed airborne and ground based cloud seeding operations over portions of the central and southern Sierra Nevada Mountains. Set up and performed routine maintenance of ground based ice nucleus generators. Provided daily forecasts for clients and project personnel.
Meteorologist, Independent Contractor, (Boise, ID) – October 2007 to April 2008
Provided meteorological services to support Idaho Power Company's winter cloud seeding project in West Central Idaho, directed airborne and ground seeding operations, directed rawinsonde releases, provided short-term operational forecasts and nowcasts for pilots, communicated with aircraft via two-way radio
Field Meteorologist, North Dakota Cloud Modification Project, (Stanley or Bowman, ND) – Summers, 2003-2009
Operated 5 cm weather radar equipped with TITAN software package, launched and directed seeding aircraft using two-way radio and GPS tracking, performed data recording and documentation of cloud seeding operations, prepared silver iodide seeding solution, assisted with radar calibrations, prepared forecasts and briefed pilots daily, supervised intern meteorologists, presented case studies for ground school, operated cloud condensation nuclei counter for joint research with South Dakota School of Mines
Forecaster, Atmospherics Incorporated, (Fresno, CA) - October 2006 - May 2007
Field Meteorologist, Atmospherics, Inc. (Modesto, CA) - November 2005 - April 2006
Field Meteorologist, Atmospherics, Inc. (Paso Robles, CA) - December 2004 - February 2005
Provided daily forecasts for seeding operations and/or clients, operated 5cm weather radar, directed winter cloud seeding operations over the Sierra Nevada utilizing both glaciogenic and hygroscopic seeding agents, traced radar overlays, performed data recording of operations, wrote monthly and annual reports

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Memberships and Honors

- Meteorologist Distinguished Service Award, 2013, Weather Modification Association
- Member, Weather Modification Association (certified operator #78)
- Member, American Meteorological Society
- Iowa Central Community College Honor Society, inducted April 27, 2000
- Wilbur E Brewer Professionalism Award, 2007 North Dakota Cloud Modification Project

Field Address: Olds-Didsbury Airport, Highway 2A, Olds, AB T4H 1A1
Field Telephone no. 403-335-8359
Field personnel: full time = 3
part time = 12

Daily records of activities: Custodian = Ms. Erin Fischer
WMI Project Operations Centre
Olds-Didsbury Airport, Highway 2A, AB T4H 1A1

All records are maintained June 1st -Sept. 15th annually.

- daily weather synopsis and forecast report
- radar echo storm data report and maps
- daily operations summary report
- chemical inventory report
- equipment status report
- aircraft flight track maps
- flight log report
- project aircraft maintenance report

## PART 6. GENERAL INFORMATION CONCERNING PROPOSED ACTIVITY

Reasons for organization seeking modified weather: The hailstorm on Sept. 7, 1991 caused >$400 million damage in the City of Calgary alone. Hailstorms in the City of Calgary caused >$500 Million in 2010 and again in 2012. In addition, hailstorms have caused >$100 Million damage to crops annually since 2007 and the damage to crops was >$400 Million in 2012. Hailstorms have now become a billion dollar problem to the economy of Alberta. The 20 largest insurance companies and their affiliates have banded together to conduct hail suppression operations in the "hail alley" of central Alberta to combat urban hail damage in the Calgary to Red Deer area. The current program has conducted cloud-seeding operations in central Alberta each summer since 1996.

Specific modification sought: Diminish hail damage to property in central Alberta with special priority given to the urban areas of Calgary and Red Deer.

Quantitative estimate of modification expected: Even very small positive results (+1%) will be economically beneficial, however, it is hoped that reductions in damage on the order of 25% or greater will be realized. The insurance industry has been encouraged by the results, estimating a savings of several hundred-million dollars to the industry, paying out approximately 50% of what they expected.

Secondary effects anticipated: Reductions in crop damage due to hail should also be realized. Seeding may also provide an increase in precipitation according to recent analyses of radar data. The crop hail insurance data for the first 10 years of the project indicated a reduction in the loss-to-risk values compared with the historical 58 year average for the province as a whole. However, a recent analysis shows increased variability and an increasing trend in hail damage over the last 5 years both inside and outside the project area which is likely due to climate change. The effect of the seeding on crop damage is inconclusive at this time.

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Geographic area affected (see attached map): The main project area is from Calgary to Red Deer, Alberta and west to the foothills of the Rocky Mountains.

Estimate of adjoining geographic area possibly affected: Areas downwind (east) of highway no. 2 to highway no. 21 may also benefit from the seeded storms.

| | |
|---|---|
| Approximate total cost: | approx. $3.1 million per year |
| Funds to be expended in Canada: | est. $500,000 per year |
| General period of operation: | June 1st - Sept. 15th annually |

## PART 7. GENERAL INFORMATION CONCERNING OPERATIONS AND TECHNIQUES

A. GENERAL: The following text describes the methods to be used, general principles of techniques, description of specific techniques, and a brief description of typical operations:

OVERVIEW OF METHOD

For hail suppression, aircraft patrolling based upon forecasts and hourly weather reports will be used to initiate seeding as soon as appropriate conditions develop. Storms will be seeded if they have radar reflectivities of approximately 35 dBZ at heights above the -5°C temperature level, and are considered to be a potential hail threat to an urban or populated area. When large hail is forecast, seeding will commence when radar reflectivities reach approximately 20 dBZ in order to start the microphysical suppression process as early as possible within the potential hailstorms. Storms will be seeded by aircraft using either droppable AgI pyrotechnics and/or wing mounted AgI pyrotechnics or AgI-solution burners.

The amount of seeding material used will depend upon the lifetime and size of the cloud or storm and other meteorological conditions. The seeding rates are about double those used during the 1970's and 1980's in Alberta. Seeding will be focused on the feeder clouds of the storm's new growth zone and will be conducted at cloud top and cloud base. Further details of the seeding method are discussed below.

HAIL SUPPRESSION HYPOTHESIS

The cloud seeding hypothesis is based on the cloud microphysics concept of "beneficial competition". Beneficial competition assumes a lack of natural ice nuclei in the environment effective at temperatures warmer than -20°C and that the injection of AgI will result in the production of a significant number of "artificial" ice nuclei. The natural and artificial ice crystals "compete" for the available supercooled liquid cloud water within the storm. Hence, the hailstones that are formed within the seeded cloud volumes will be smaller and produce less damage if they should survive the fall to the surface. If enough nuclei are introduced into the new growth region of the storm, then it is possible that the hailstones will be small enough to melt completely before reaching the ground.

Cloud seeding operations are intended to alter the cloud microphysics of the treated clouds, assuming that the present precipitation process is inefficient due to a lack of natural ice nuclei. The seeding is based on a conceptual model of Alberta hailstorms that evolved from the studies of Chisholm (1970), Chisholm and Renick (1972), Barge and Bergwall (1976), Krauss and Marwitz (1984), English and Krauss (1986) and English (1986).

It is assumed that hail embryos grow within the time evolving "main" updraft of single cell storms and within the updrafts of developing "feeder clouds" or cumulus towers that flank mature "multi-cell" and "super-cell" storms (see e.g. Foote 1984). The growth to large hail is hypothesized to occur along the edges of the main storm updraft where the merging feeder clouds interact with the main storm updraft.

For hail suppression, seeding with a large amount of silver-iodide will dramatically increase the ice crystal concentration in thunderstorm clouds and compete for the available supercooled cloud water to prevent the growth of large, damaging, ice particles. Based on WMI's experience, the cloud seeding will be targeted on the feeder cloud updraft regions associated with the production of hail and will leave unseeded those regions of the storm associated with the production of rain only. This will make efficient

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use of the seeding material (AgI) and will reduce the possible risk of overseeding rain clouds.

## CLOUD SEEDING METHODOLOGY - SEEDING TECHNIQUES

Convective cells (defined by radar) with maximum reflectivity approximately >35 dBZ within the cloud layer above the -5°C level, located within the project areas or within a 20 min travel time "buffer zone" upwind of the project area, will be seeded if they pose a potential threat of damaging hail for an urban or populated area. Radar observers/controllers will be responsible for making the "seed" decision and directing the cloud seeding missions.

Patrol flights will be launched before clouds within the target area meet the radar reflectivity seeding criteria. These patrol flights are meant to provide immediate response to developing cells. In general, a patrol is launched in the event of visual reports of vigorous towering cumulus clouds near Calgary or Red Deer, or when radar cells exceed 25 kft height over the higher terrain along the western border and begin moving towards the urban areas.

Launches of more than one aircraft are determined by the number of storms in each area, the lead time required for a seeder aircraft to reach the proper location and altitude, and projected overlap of coverage and on-station time for multiple aircraft missions. In general, only one aircraft can work safely at cloud top and one aircraft at cloud base for a single storm. The operation of three aircraft is recommended to provide uninterrupted seeding coverage at either cloud-base or cloud-top and to seed three storms simultaneously if required.

The program is designed to seed convective clouds, before they achieve radar reflectivities associated with hail, and deliver seeding material to regions of updraft and supercooled liquid water i.e. the primary conditions responsible for the growth of hailstones.

Factors that determine cloud top or cloud base seeding are: storm structure, visibility, cloud base height, or time available to reach seeding altitude. Cloud base seeding is conducted by flying at cloud base within the main inflow of single cell storms, or the inflow associated with the new growth zone (shelf cloud) located on the upshear side of multi-cell storms.

Cloud top seeding is conducted between typically between -5°C and -10°C. The pencil flares fall approximately 1.5 km (approximately 10°C) during their 35-40 second burn time. The seeding aircraft will penetrate the edges of single convective cells meeting the seed criteria. For multi-cell storms, or storms with feeder clouds, the seeding aircraft will penetrate the tops of the developing cumulus towers on the upshear sides of convective cells, as they grow up through the aircraft's altitude.

Occasionally, with embedded cells or convective complexes, there are no clearly defined feeder turrets visible to the flight crews or on radar. In these instances, at an altitude between -5°C and - 10°C, a seeding aircraft will penetrate the storm edge (region of tight radar reflectivity gradient) on the upshear side and burn a burn-in-place flare and inject droppable pencil flares when updrafts are encountered.

Seeding is effective only within cloud updrafts and in the presence of supercooled cloud water, i.e. the developing, and mature stages in the evolution of the classic thunderstorm conceptual model. The dissipative stages of a storm would be seeded only if the maximum reflectivity is particularly severe and there is evidence (visual cloud growth, or tight reflectivity gradients) indicating the possible presence of embedded updrafts.

## SEEDING RATE

A seeding rate of one 20 g flare every 5 s is typically used during cloud penetration. A slightly higher rate is used (e.g. 1 flare every 2 s) if updrafts are very strong (e.g. > 2000 ft/min) and the storm is particularly intense. Calculations show that this seeding rate will produce >1300 ice crystals per litre which is more than sufficient to deplete the liquid water content produced by updrafts of 10 m/s (2000 ft/min), thereby preventing the growth of hailstones within the seeded cloud volumes.

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A cloud seeding pass is repeated immediately if there are visual signs of new cloud growth or radar reflectivity gradients remain tight (indicative of persistent updrafts). A 5 to 10 min waiting period may be used, to allow for the seeding material to take effect and the storm to dissipate, if visual signs of glaciation appear or radar reflectivity values decrease and gradients weaken. This waiting period precludes the waste of seeding material and ensures its optimum usage.

For cloud base seeding, a typical seeding rate of 1 burn-in-place flare (150 g each) is used. Cloud seeding runs are repeated until no further inflow is found. Acetone burners will also be used to provide continuous silver iodide seeding if extensive regions of weak updraft are observed at cloud base and the shelf cloud region. Base seeding is not conducted if only downdrafts are encountered at cloud base, since this would waste seeding material.

The cloud seeding flares are silver-iodide pyrotechnics with an ice nuclei effectiveness of approximately $10^{14}$ nuclei per gram of pyrotechnic, active at -10°C, as determined by independent cloud chamber tests at Colorado State University.

Sufficient dispersion of the particles is required for AgI plume overlap from consecutive flares by the time the cloud particles reach hail size for effective hail suppression. The work by Grandia et al. (1979) based on turbulence measurements within Alberta feeder clouds indicated that the time for the diameter of the diffusing line of AgI to reach the integral length scale (200 m) in the inertial subrange size scales of mixing, was 140 seconds. This is insufficient time for ice particles to grow to hail size. Therefore, dropping flares at 5 sec intervals should effectively deplete the supercooled liquid water and prevent the growth of hail particles. The use of the 20 gram flares and a frequent drop rate provides better seeding coverage than using larger flares with greater time/distance spacing between flare drops. In fact, the above calculations are conservative when one considers that the center of the ice crystal plume center will have a higher concentration of crystals.

B. EQUIPMENT:

- One WMI-C band weather radar, 250 kw peak power, with 1.65 deg. beam width, located at the Olds-Didsbury airport, 50ft tower mounted including radome.
- Three Beechcraft C90 King-Air prop-jet aircraft (two in Springbank and one in Red Deer).
- Two Cessna 340 aircraft (one in Springbank and one in Red Deer).

C. MATERIALS TO BE EMITTED:

- Cloud top (ejectable) pyrotechnic flares are 20g AgI formulation manufactured by Ice Crystal Engineering (ICE) of Kindred, North Dakota, USA (www.iceflares.com)
- Cloud base (burn-in-place) flares are 150g AgI formulation manufactured by Ice Crystal Engineering (ICE) of Kindred, North Dakota, USA (www.iceflares.com)
- A solution of acetone, silver iodide, sodium perchlorate, paradichlorobenzene, and ammonium iodide will also be burned for continuous seeding at cloud base.

Activation tests performed at Colorado State University indicate greater than$10^{14}$ ice crystals per gram of seeding agent burned, active at -10°C.

Total flight hours and quantities to be dispersed: We estimate the project may use 5000 twenty-gram flares and 500 one hundred-fifty gram flares, plus approximately 150 gallons of acetone (2% AgI solution) will be burned. The number of operational days, flights, and amount of seeding material dispensed over the past fifteen years is summarized in the attached table. No harmful effects from these materials is expected. This is based on years of studies (both in the USA and Canada) to detect silver in precipitation (above background levels) following cloud seeding. The amount of silver distributed by the cloud seeding is small compared to the output from industry. Silver amounts from cloud seeding are far, far less than the USA EPA guidelines.

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## PART 8. GENERAL INFORMATION CONCERNING USE OF AIRCRAFT.

- Three C90 King Air prop-jet aircraft, two in Springbank (N904DK and N518TS) and one based in Red Deer (N522JP).
- Two Cessna 340 aircraft, one in Springbank (N457DM) and one in Red Deer (N98585).

## PART 9. GENERAL INFORMATION CONCERNING USE OF GROUND VEHICLES.

No special project ground vehicles will be used on the project. (Only private vehicles for personal transportation will be used.)

## PART 10. GENERAL INFORMATION CONCERNING ANY MEASUREMENTS OR OBSERVATION INSTRUMENTATION.

No special surface observations are planned for this project. The primary instrumentation is the weather radar and special aircraft instrumentation. Daily weather charts will be recorded for documentation and reporting purposes.

AIRCRAFT TRACKING GLOBAL POSITIONING SYSTEM (GPS): The WMI weather radar control and communications center will be equipped to receive and record data from the GPS aircraft tracking system. The GPS system displays the exact position of aircraft superimposed on the radar display to enable the controller to accurately direct the seeding aircraft to optimum seeding locations within the storm system. The color-coded aircraft position on the PPI will be marked with a small symbol. Electronic coding will enable radar controllers to discriminate between all project aircraft.

TEMPERATURE INSTRUMENTATION: Each of the cloud seeding aircraft will have a temperature sensor to ensure that the cloud penetration seeding runs are conducted at the proper temperature levels.

WEATHER RADAR: The C-band radar will be equipped with a computerized radar recording and display system. The radar recording system will be capable of providing numerous cell statistics and colour products including plots of radar PPI displays and maximum reflectivity maps. The sophisticated radar tracking software called TITAN (Thunderstorm Identification, Tracking, Analysis, and Nowcasting) has been used since 1997 and has proved to be very useful. TITAN is licensed from NCAR.

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**PART 11. CERTIFICATION BY ORGANIZATION FOR WHOM ACTIVITY IS TO BE CONDUCTED:**

State type of working agreement entered into with the weather modifier: Contract.

I HEREBY CERTIFY THAT ALL STATEMENTS MADE IN THIS NOTIFICATION OF INTENT TO ENGAGE IN WEATHER MODIFICATION ACTIVITIES ARE TRUE AND COMPLETE TO THE BEST OF MY KNOWLEDGE, AND REPRESENT IN SUBSTANCE AN ACCURATE DESCRIPTION OF A PROPOSAL TO UNDERTAKE WEATHER MODIFICATION ACTIVITIES ON BEHALF OF THE ORGANIZATION NAMED HEREIN.

Name of organization: Alberta Severe Weather Management Society

Full name of certifying officer and title:

Todd Klapak
President, Alberta Severe Weather Management Society
(403) 231-1357, Todd.Klapak@intact.net

Signature:  Date: May 28, 2013

**PART 12. CERTIFICATION BY PERSON PROPOSING TO CONDUCT ACTIVITY.**

I HEREBY CERTIFY THAT INFORMATION PROVIDED IN THIS NOTIFICATION OF INTENT TO ENGAGE IN WEATHER MODIFICATION ACTIVITIES IS A TRUE AND COMPLETE DESCRIPTION OF MY PROPOSED PLANS TO ENGAGE IN THE SPECIFIC WEATHER MODIFICATION ACTIVITIES HEREIN DESCRIBED.

Name of organization: Weather Modification, Inc.

Full name of certifying officer:
Bruce A. Boe
Director of Meteorology
(701) 235-5500

Signature: Date: May 9, 2013

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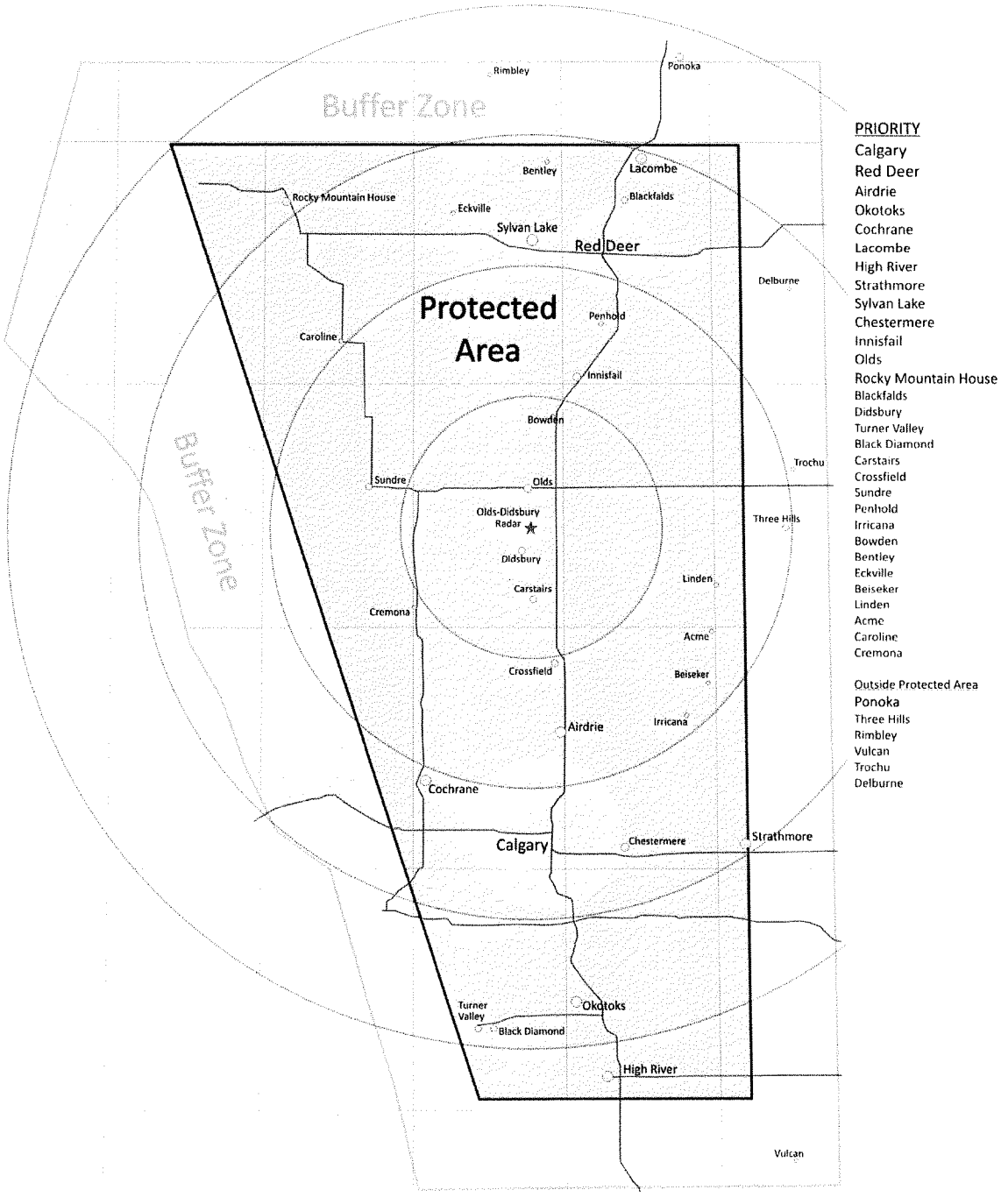


**Figure 1: Map of south-central Alberta showing the project area, outlined in green, covered by the Hail Suppression activities.**

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***Table 1: Operational Statistics for 1996 to 2012.***

| | Mean | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Storm Days with Seeding | 31.5 | 29 | 38 | 31 | 39 | 33 | 36 | 27 | 26 | 29 | 27 | 28 | 19 | 26 | 20 | 42 | 48 | 37 |
| Aircraft Missions (Seeding & Patrol) | 101 | 71 | 92 | 96 | 118 | 130 | 109 | 92 | 92 | 105 | 80 | 92 | 76 | 112 | 37 | 91 | 134 | 143 |
| Total Flight Time (hours) | 207.8 | 159.1 | 188.1 | 189.9 | 251.3 | 265.2 | 208.3 | 157.4 | 163.6 | 227.5 | 157.9 | 190.2 | 115.3 | 194.7 | 109.3 | 271.8 | 383.0 | 300.1 |
| Number of Storms Seeded | 93 | 75 | 108 | 153 | 162 | 136 | 98 | 54 | 79 | 90 | 70 | 65 | 41 | 56 | 30 | 118 | 134 | 116 |
| Total Seeding Agent (kg) | 195.8 | 163.3 | 110.8 | 111.1 | 212.7 | 343.8 | 195.0 | 124.2 | 173.4 | 270.9 | 159.1 | 214.0 | 99.7 | 122.9 | 48.4 | 263.8 | 400.1 | 314.6 |
| Seeding Agent per Day (kg) | 6.1 | 5.6 | 2.9 | 3.6 | 5.5 | 10.4 | 5.4 | 4.6 | 6.7 | 9.3 | 5.9 | 7.6 | 5.2 | 4.7 | 2.4 | 6.3 | 8.3 | 8.5 |
| Seeding Agent per Hour (kg) | 0.97 | 1.00 | 0.60 | 0.60 | 0.80 | 1.30 | 0.90 | 0.80 | 1.10 | 1.20 | 1.00 | 1.10 | 0.90 | 1.00 | 0.84 | 1.10 | 1.13 | 1.16 |
| Seeding Agent per Storm (kg) | 2.2 | 2.2 | 1.0 | 0.7 | 1.3 | 2.5 | 2.0 | 2.3 | 2.2 | 3.0 | 2.3 | 3.3 | 2.4 | 2.2 | 1.6 | 2.2 | 3.0 | 2.7 |
| Ejectable Flares | 4610 | 3817 | 2376 | 2023 | 4439 | 9653 | 5225 | 3108 | 4465 | 6513 | 3770 | 4929 | 1622 | 1648 | 451 | 5837 | 10779 | 7717 |
| BIP Flares | 619 | 542 | 356 | 496 | 690 | 940 | 533 | 377 | 518 | 877 | 515 | 703 | 413 | 548 | 237 | 851 | 1020 | 914 |
| Seeding Solution (gal) | 154.6 | 80.5 | 144.3 | 193.8 | 297.5 | 141.3 | 140.8 | 80.3 | 92.6 | 132.7 | 94.2 | 145.4 | 77.0 | 113.5 | 56.5 | 227.5 | 350.2 | 260.3 |
| Season Activity Rank | - | 14 | 10 | 8 | 4 | 3 | 7 | 15 | 11 | 6 | 13 | 9 | 16 | 12 | 17 | 5 | 1 | 2 |

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# NOTICE OF INTENT TO ENGAGE IN WEATHER MODIFICATION ACTIVITIES
## PURSUANT TO THE WEATHER MODIFICATION INFORMATION ACT AND REGULATIONS
## SCHEDULE I

## PART 1. GENERAL IDENTIFICATION OF ACTIVITY

| | |
|---|---|
| Date of notice: | May 3rd, 2012 |
| Proposed starting date: | June 1st, 2012 |
| Expected duration: | September 15th, 2012 |

Province and area to be affected: Central Alberta, covering the Red Deer to Calgary regions (see attached map showing project area which has remained the same since 1996).

| | |
|---|---|
| Weather elements to be modified: | Thunderstorms |
| Modification expected: | Hail Suppression |
| Class of operation: | Operational |
| Operating method: | Airborne |
| Class of economy to benefit: | insurance industry: private and public property primary, agriculture secondary. |

## PART 2. GENERAL INFORMATION CONCERNING WEATHER MODIFIER

| | | |
|---|---|---|
| Organization name: | Weather Modification Inc. (WMI)<br>http://www.weathermodification.com/ | |
| Parent Organization: | Weather Modification Inc. (WMI)<br>3802 20th Street North<br>Fargo, ND USA 58102 | |
| Chief Officer: | Mr. Patrick H. Sweeney, President<br>pat@weathermod.com | Tel: (701) 235-5500 |
| Local Organization: | Weather Modification, Inc.<br>Olds-Didsbury Airport, Highway 2A<br>Olds, AB T4H 1A1 | Tel. (403) 335-8359 |

Name and relevant qualifications of officer(s) designated in charge of project:

| | |
|---|---|
| Chief Officer: | Mr. Daniel Gilbert, Chief Meteorologist<br>B.S., 9 years' experience<br>WMA Certified Weather Modification Operator #78<br>Office Tel: (403) 335-8359<br>(see Part 5 for details of qualifications and experience) |
| Director of Meteorology | Mr. Bruce Boe<br>Project Manager/Meteorology, 38 years' experience<br>Tel: (701) 235-5500 |

Primary activities of organization (see web page at www.weathermodification.com):

- Cloud seeding
- Atmospheric research
- Air pollution monitoring
- Meteorological radar monitoring
- Equipment design and fabrication
- Aircraft modifications

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Amount of public liability insurance carried applicable to activity: CAD$50 million by the Alberta Severe Weather Management Society and US$5 million by Weather Modification, Inc.

List of similar weather modification activities previously undertaken:

a. Canada: The Alberta Hail Project has been operating in its present form since 1996. The contractor (operator) for this entire period has been WMI.

b. Elsewhere:

- WMI has conducted the hail suppression cloud seeding in North Dakota for more than 35 years. This is an ongoing project.
- WMI conducted hail suppression in Mendoza, Argentina using 3 to 4 Cheyenne II aircraft and a Lear Jet 1998-2004.
- WMI conducted operational cloud seeding in Oklahoma for Rain Enhancement and Hail Suppression 1997-2001.
- WMI has conducted operational cloud seeding in Alberta, California, Greece, Texas, California, Idaho, Mexico, UAE, India, Indonesia, Mali, Nevada, North Dakota, Oklahoma, Saudi Arabia, and Wyoming within the last 10 years.

References:

1. Dr. Terry Krauss
   Krauss Weather Services
   13 Roche Street
   Red Deer, AB T4P 3K8 Tel. 403-342-5685
2. Mr. Darin Langerud, Director
   State of North Dakota Atmospheric Resource Board
   900 E. Boulevard Ave.
   Bismarck, ND 58505 Tel. 701-328-2788
3. Mr. George W. Bomar, Director
   Texas Department of Licensing and Regulation
   Austin, TX 78711 Tel. 512-936-4313
4. Dr. Paul L. Smith, Director
   Institute of Atmospheric Sciences
   South Dakota School of Mines & Technology
   501 E. St. Joseph Street
   Rapid City, SD 57701-3995 Tel. 605-394-2291

List of subcontractors: WMI owns and operates its own fleet of aircraft and weather radars. No major sub-contractors are being used on the Alberta Hail project for aircraft or radar services. Solution Blend Services, Calgary, Alberta (403) 207-9840 will be handling and mixing seeding solutions for the project.

## PART 3. GENERAL INFORMATION CONCERNING ORGANIZATION FOR WHOM ACTIVITY IS TO BE CONDUCTED.

Name of organization: Alberta Severe Weather Management Society (ASWMS)

Chief officers: Mr. Todd Klapak, President
todd.klapak@intact.net
Ms. Catherine Janssen, Secretary-Treasurer
janssenc@telus.net

Nature of organization: A not-for-profit society of the property and casualty insurers and brokers operating in Alberta. The society was formed for the purpose of collecting funds from its members to operate a hail suppression program to help reduce insurance payout due to hail and stabilize insurance rates throughout the province.

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## PART 4. GENERAL INFORMATION CONCERNING FIELD BASES OF ACTIVITY

Address and location of project primary field base:

- Olds-Didsbury Airport, Alberta tel. 403-335-8359

Address(es) and locations(s) of project secondary field base(s):

- Calgary International Airport tel. 403-250-8070
- Red Deer Industrial Airport tel. 403-886-4187

## PART 5. GENERAL INFORMATION CONCERNING OPERATING FIELD PERSONNEL

Name and title of field officer in charge: Mr. Daniel Gilbert, Chief Meteorologist
Old-Didsbury Airport, Highway 2A
Olds, AB T4H 1A1

tel. & fax. 403-335-8359,
e-mail: dgilbert@weathermodifcation.com
home page: http://www.weathermodification.com/

Qualifications of field officer in charge (Gilbert):

Education
Bachelor of Science, Meteorology and Environmental Studies (double major) May 2004, Iowa State University, Ames, IA
Associate of Arts, Liberal Arts, May 2000, Iowa Central Community College, Fort Dodge, IA

Weather Modification Experience
Chief Meteorologist, Weather Modification, Inc. (Wyoming and Alberta) - November 2009 to present
Forecaster, radar operator, rawinsondes, direction of seeding aircraft. Case declarations, wintertime (Wyoming) research program.
Meteorologist, RHS Consulting (Fresno, CA) – November 2008-February 2009
Directed airborne and ground based cloud seeding operations over portions of the central and southern Sierra Nevada Mountains. Set up and performed routine maintenance of ground based ice nucleus generators. Provided daily forecasts for clients and project personnel.
Meteorologist, Independent Contractor, (Boise, ID) – October 2007 to April 2008
Provided meteorological services to support Idaho Power Company's winter cloud seeding project in West Central Idaho, directed airborne and ground seeding operations, directed rawinsonde releases, provided short-term operational forecasts and nowcasts for pilots, communicated with aircraft via two-way radio
Field Meteorologist, North Dakota Cloud Modification Project, (Stanley or Bowman, ND) – Summers, 2003-2009
Operated 5 cm weather radar equipped with TITAN software package, launched and directed seeding aircraft using two-way radio and GPS tracking, performed data recording and documentation of cloud seeding operations, prepared silver iodide seeding solution, assisted with radar calibrations, prepared forecasts and briefed pilots daily, supervised intern meteorologists, presented case studies for ground school, operated cloud condensation nuclei counter for joint research with South Dakota School of Mines
Forecaster, Atmospherics Incorporated, (Fresno, CA) - October 2006 - May 2007
Field Meteorologist, Atmospherics, Inc. (Modesto, CA) - November 2005 - April 2006
Field Meteorologist, Atmospherics, Inc. (Paso Robles, CA) - December 2004 - February 2005
Provided daily forecasts for seeding operations and/or clients, operated 5cm weather radar, directed winter cloud seeding operations over the Sierra Nevada utilizing both glaciogenic and hygroscopic seeding agents, traced radar overlays, performed data recording of operations, wrote monthly and annual reports

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Memberships and Honors

- Member, Weather Modification Association (certified operator #78)
- Member, American Meteorological Society
- Iowa Central Community College Honor Society, inducted April 27, 2000
- Wilbur E Brewer Professionalism Award, 2007 North Dakota Cloud Modification Project

Field Address: Olds-Didsbury Airport, Highway 2A, Olds, AB
Field Telephone no. 403-335-8359
Field personnel: full time = 3
part time = 10

Daily records of activities: Custodian = Ms. Erin Fischer
WMI Project Operations Centre
Olds-Didsbury Airport, Highway 2A, AB T4H 1A1

All records are maintained June 1st -Sept. 15th annually.

- Daily weather synopsis and forecast report
- Radar echo storm data report and maps
- Daily operations summary report
- Chemical inventory report
- Equipment status report
- Aircraft flight track maps
- Flight log report
- Project aircraft maintenance report
- Radar calibration report

## PART 6. GENERAL INFORMATION CONCERNING PROPOSED ACTIVITY

Reasons for organization seeking modified weather: Hailstorms cause an average of approximately $100 million damage to private and public property annually in Alberta. The hailstorm on Sept. 7, 1991 caused >$400 million damage in the City of Calgary alone. Over 40 major Alberta insurers, as well as reinsurers and brokers, have donated > $15 million to conduct a hail suppression project since 1996.

Specific modification sought: Diminish hail damage to property in central Alberta with special priority given to the urban areas of Calgary and Red Deer.

Quantitative estimate of modification expected: Even very small positive results (+/- 1%) will be economically beneficial, however, it is hoped that reductions in damage on the order of 25% or greater will be realized. After 10 years, the insurance industry is very encouraged by the results, estimating a savings of several hundred-million dollars to the industry, paying out approximately 50% of what they expected.

Secondary effects anticipated: Reductions in crop damage due to hail should also be realized. Seeding may also provide an increase in precipitation according to recent analyses of radar data. The crop hail insurance data for the last 10 years indicates a reduction in the loss-to-risk values compared with the historical 58 year average for the province as a whole. However, a recent analysis shows increased variability and an increasing trend in hail damage over the last 5 years both inside and outside the project area which is likely due to climate change. There are no significant changes in the crop damage within the target area for the last 10 years, compared with the previous 15 years. The effect of the seeding on crop damage is inconclusive at this time.

Geographic area affected (see attached map): The main project area is from Calgary to Red Deer, Alberta and west to the foothills of the Rocky Mountains.