

Consolidated Data Report
Colorado Springs Tracer Experiment
(COSTEX)

30 May 2014

For publication/public release by the United States Air Force

Executive Summary

(1) Atmospheric tracer studies were conducted in the Colorado Springs - Pueblo area on October 18, 21, and 23, 2010. Three different inert non-toxic perfluorocarbon tracers (PFT) were released over short durations, each from different locations, and sampled at ten locations up to 50 km away from the source in mountainous terrain. Thirty minute duration air samples were collected over a 3.5 hour period during each of the three experiment days.

Introduction

(2) As the U.S. Armed Forces increasingly move away from flat desert-like terrain to conducting operations in complex, mountainous terrain, the ability to model wind patterns over these regions becomes more vital for a variety of reasons. The objective of the atmospheric tracer study described in this report is to validate atmospheric transport and dispersion models over mountainous terrain by attempting to predict the quantities of the PFTs measured at various sampling locations after release from a considerable distance away. This report summarizes the collection methods and tabulates the tracer concentration data obtained during the experiment.

Test Site

(3) The greater Colorado Springs – Pueblo area was selected for the test region; specifically, within an arc approximate 60km arc from the Cheyenne Mountain Air Station tunnel entrance. The parking lot of Cheyenne Mountain Air Station's (CMAS) tunnel entrance was selected as the site for the primary tracer release mechanism. Two secondary release sites were identified, one to the north of CMAS, the parking lot of St. Paul's Catholic Church, and one location to the south of CMAS, the intersection of SH-115 and Rock Creek Canyon Road.

(4) The air sample collection sites were all located on public lands within the aforementioned 60km arc. The collection sites were chosen to obtain a reasonable level of certainty in being intercepted by the released PFT plume and ease of access. The sites are separated by approximately 5 – 10 km from each other and scattered throughout the test area. All are accessible by both paved and unpaved roads, the latter which required full-size 4x4 vehicles for transit.

Tracer Release

(5) Three different PFTs with their own unique chemical characteristics were used for the test: perfluorodimethylcyclobutane (PDCB), perfluorodimethylcyclohexane (PDCH), and perfluorotrimethylcyclohexane (PTCH). These perfluorocarbons are extremely stable non-toxic compounds, and because of their low ambient background concentration are measurable at very low concentrations by gas chromatography and electron capture detection. Furthermore, PFT detection sensitivities of a fraction of a parts-per-trillion means that each experiment can be conducted with the release of 1 kg or less of tracer and no adverse environmental impact. PFT's have been routinely used as atmospheric tracers since 1980.

(6) The PDCH will serve as the primary PFT used exclusively in the Brookhaven National Laboratory (BNL) provided primary release mechanism. PTCH and PDCB were used at the secondary release sites. At the secondary release sites, the PFT was simply poured on the pavement, the release being accomplished through evaporation and therefore the evaporation times varied according to the meteorological conditions. At the primary site, a spinning-cup aerator vaporized the tracer and released it at an elevation of 1 m. The aerator mechanism provided a controlled release for a predetermined amount of time. In general, the controlled releases lasted one hour, while the secondary releases lasted from 2 to 35 minutes. The release mechanism, along with the PFTs, was stored and charged overnight at CMAS when not in use.

Air Sampling

(7) Collection of the PFTs was done using the Brookhaven Atmospheric Tracer Samplers (BATS). BATS were placed in protective plastic bins with tubing propped up 1m above ground for optimal collection. There were 11 BATS deployed at the various pre- determined collection sites (one site always contained duplicate samplers) which were moved between experiments to different locations. The BATS were stored in the collection teams' respective hotel rooms.

(8) Because the BATS are capable of capturing sub-ppt levels of gas, extreme care was taken throughout the test to ensure physical separation of the PFTs and the BATS. As such, a "pitching" team responsible for the handling of the bulk PFTs and the operation of the release mechanism and a "catching" team responsible the operation and maintenance of the BATS was geographically separated from each other for the duration of the field tests. Care was taken to ensure both teams avoided contact with each other when off-duty as well. The pitching team operated in southern Colorado Springs, while the catching team was based out of northern Colorado Springs.

Release Operations

(9) The pitching team was based out of southern Colorado Springs in close proximity to the CMAS, Fort Carson, and Peterson AFB. A "quarantine area" was established to encompass I-25 south of US-24 and north of Academy Blvd as well as CO-115 south of US-24 and north of Keeton Reservoir. The quarantine area was not intended to be used as an outright travel restriction for the pitching team, but rather as a reference for the catching team to avoid cross- contamination of the BATS with the bulk PFT.

(10) Every morning the pitching team compiled the day's weather report to include a complete forecast on the day's wind patterns. This report was relayed, via phone, to the catching team. Once a "go" decision was confirmed, the pitching team proceeded to CMAS to set up the primary release mechanism and prepare for the secondary evaporative releases according to the day's event timeline. Evaporative releases were conducted over asphalt as earthen sites do not provide sufficient vaporization.

Collection Operations

(11) The catching team was based out of northern Colorado Springs for easy access to the northern and eastern collection sites thereby avoiding unnecessary passage through the "quarantine area". When the wind patterns dictated the necessity for a southern or western collection site, team members would ensure they are clear of the quarantine area 30 min prior to the day's first release.

(12) Once the "go" decision has been made, the wind patterns dictate the location of the pre- identified collection sites used that day. Deployment times of the BATS are based on the day's event timeline. The catching team consisted of 4 separate sub-teams which are assigned 2-3 BATS each to deploy and control for the day.

(13) After deployment of the BATS, the collection team members confirmed that the tubes switched to the next sampling tube after the first 30 min interval. No further action (less sampler security concerns) was needed until the end of the 3.5 hour collection period. Each sub-team then collected all the BATS under their control and brought them back to their hotel rooms for recharging.

Detailed Release Scenarios

(14) Operator release notes are given in Appendix A. Experiments were conducted on 18, 21, and 23 October, 2010. On October 20th, one kg of PTCH tracer was released from the secondary southern release site for 13 minutes starting at 12:28 but the remainder of the releases was cancelled due to light winds. BATS sampling was not conducted. The other releases are summarized in the next three tables.

(15) Monday, 18 October

| Site | Location | Latitude | Longitude | Tracer | Time (LMT) | Release Delta (g) | Total (g) |
|------|-------------|----------|------------|--------|------------|-------------------|-----------|
| AR1 | SH-115 | 38.70195 | -104.82788 | PTCH | 12:00 | 0 | 0 |
| | | | | | 12:17 | 1010 | 1010 |
| AR2 | Cheyenne Mt | 38.74330 | -104.84370 | PDCH | 12:00 | 0 | 0 |
| | | | | | 12:33 | 180 | 180 |
| | | | | | 12:47 | 120 | 300 |
| | | | | | 13:00 | 300 | 600 |
| | | | | | 13:10 | 600 | 1200 |
| AR3 | Church | 38.79050 | -104.85520 | PDCB | 13:46 | 0 | 0 |
| | | | | | 13:48 | 500 | 500 |

(16) Thursday, 21 October

| Site | Location | Latitude | Longitude | Tracer | Time (LMT) | Release Delta (g) | Total (g) |
|------|-------------|----------|------------|--------|------------|-------------------|-----------|
| AR1 | SH-115 | 38.70195 | -104.82788 | PDCB | 12:28 | 0 | 0 |
| | | | | | 12:30 | 990 | 990 |
| AR2 | Cheyenne Mt | 38.74330 | -104.84370 | PDCH | 13:00 | 0 | 0 |
| | | | | | 13:05 | 360 | 360 |
| | | | | | 13:10 | 240 | 600 |
| | | | | | 13:25 | 300 | 900 |
| | | | | | 13:31 | 300 | 1200 |
| AR3 | Church | 38.79050 | -104.85520 | PTCH | 14:11 | 0 | 0 |
| | | | | | 14:33 | 500 | 500 |

(17) Saturday, 23 October

| Site | Location | Latitude | Longitude | Tracer | Time (LMT) | Release Delta (g) | Total (g) |
|------|-------------|----------|------------|--------|------------|-------------------|-----------|
| AR3 | Church | 38.79050 | -104.85520 | PDCB | 08:30 | 0 | 0 |
| | | | | | 08:32 | 1000 | 1000 |
| AR2 | Cheyenne Mt | 38.74330 | -104.84370 | PDCH | 08:30 | 0 | 0 |
| | | | | | 08:40 | 408 | 408 |
| | | | | | 09:20 | 552 | 960 |
| | | | | | 09:30 | 240 | 1200 |
| AR1 | SH-115 | 38.70195 | -104.82788 | PTCH | 09:30 | 0 | 0 |
| | | | | | 10:05 | 500 | 500 |

Sample Analysis

(18) After completion of the three releases, the BATS were returned to BNL, where the samples were analyzed to determine the concentration of each of the three tracers in each collected sample. See <http://www.bnl.gov/envsci/tracer/> for more information about BNL PFT analysis procedures. Three spreadsheets, showing the concentrations for each sampling day, are included in this report in Appendix B1, B2, and B3. In addition, the sampling data in a standardized format can also be found on-line at <http://www.arl.noaa.gov/DATEM.php>. Note that for the on-line data, duplicate samples have been eliminated (18th #7; 21st #10 and #11; 23rd #11). Sample and release information files are identified according to the release location (1, 2, 3) rather than by the name of the PFT.

Appendix A

| Date | Site Name | Local Time Mountain | GPS Coords | Chemical | Total Mass | Notes, Comments |
|-----------|--------------|------------------------|------------------------------|----------|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 18-Oct-10 | | | | | | |
| 18-Oct-10 | Chy Mnt | 7:25 | | | | Winds 2.3 Knott from 320 Calm, light cirrus clouds |
| 18-Oct-10 | AR1 | 12:00 | 38° 42.117' N 104° 49.673' W | PTCH | 1.1 kg | Green Bottle, Flash Release Evaporation Time: 17 minutes About 57 degrees F Overcast skies Wind: SSE (5-10 kts) |
| 18-Oct-10 | Chy Mnt | 12:00 | 38° 44.598' N 104° 50.621' W | o-OPDCH | 1.2 kg | Wind: S (-4 kts) Located on SE side of parking lot Low cloud cover Temp 10.6 Celsius Problem Noted: Potentiometer knob rotates and speed changes w/o changing the reading. Potentiometer at 2.4 |
| 18-Oct-10 | Chy Mnt | 12:33 | | | | Bottle about 15% done Potentiometer changed to 2.9 |
| 18-Oct-10 | Chy Mnt | 12:47 | | | | Bottle about 25% complete Potentiometer changed to 3.6 |
| 18-Oct-10 | Chy Mnt | 13:00 | | | | Bottle about 50% complete Potentiometer changed to 9.1 |
| 18-Oct-10 | Chy Mnt | 13:10 | | | | Bottle Empty |
| 18-Oct-10 | AR3 - Church | 13:46 | 38° 47.330' N 104° 51.229' W | PDCB | 0.5 kg | Pink Bottle, Flash Release Puddle spread over 1 sq meter Evaporation Time: 2 minutes Wind: SSE (- 5 kts) |
| 20-Oct-10 | | | | | | |
| 20-Oct-10 | AR1 | 12:28 | 38° 41.852' N 104° 50.114' W | PTCH | 1 kg | CANCELED TESTING, Only one release before cancel Time To Evaporate = 13 minutes Winds: Mostly from east but variable, Less than 3 kts |
| 21-Oct-10 | AR1 | 11:45 | | | | Winds: 6 knots from south (220 degrees) |
| 21-Oct-10 | AR1 | 12:28 | 38.69574° N 104.83510° W | PDCB | 0.99 kg | Upstream, Downstream PFT types reversed to compensate for 1kg wasted on 20 Oct Pink Bottle, Evaporation Time: 2 minutes |
| 21-Oct-10 | Chy Mnt | 13:00 | 38° 44.593' N 104° 50.623' W | o-OPDCH | 1.2 kg | Winds: From South at -8 kts Mostly Cloudy, -50 degrees F Winds SSE at 8 kts |
| 21-Oct-10 | Chy Mnt | 13:05 | | | | Potentiometer 6.8 Bottle at 70% |
| 21-Oct-10 | Chy Mnt | 13:10 | | | | Potentiometer changed to 5.0 Bottle at 50% |
| 21-Oct-10 | Chy Mnt | 13:25 | | | | Potentiometer changed to 4.1 Bottle at 25% |
| 21-Oct-10 | Chy Mnt | 13:31 | | | | Potentiometer changed to 6.0 Bottle Empty |
| 21-Oct-10 | AR3 - Church | 14:11 | 38.78855° N 104.85474° W | PTCH | 0.5 kg | Green Bottle, Evaporation Time: 22 minutes Winds: From South at -2 kts (140 degrees) Calm, Cloud cover mostly on south side, clear on North |
| 23-Oct-10 | | | | | | |
| 23-Oct-10 | AR3 - Church | 8:30 | 38° 47.400' N 104° 51.328' W | PDCB | 1 kg | Pink Bottle Evaporation Time: 2 min |
| 23-Oct-10 | Chy Mnt | 8:30 | 38° 44.593' N 104° 50.623' W | o-OPDCH | 1.2 kg | Winds: 3 kt out of NW Wind: Out of NE at 6 kts Mostly cloudy Temp - 47 F |
| 23-Oct-10 | Chy Mnt | 8:40 | | | | Potentiometer 5.5 Bottle at 66% |
| 23-Oct-10 | Chy Mnt | 8:50 | | | | Potentiometer changed to 4.5 |
| 23-Oct-10 | Chy Mnt | 9:00 | | | | Potentiometer changed to 2.5 |
| 23-Oct-10 | Chy Mnt | 9:20 | | | | Potentiometer changed to 2.0 Bottle at 20% |
| 23-Oct-10 | Chy Mnt | 9:25 | | | | Potentiometer changed to 4.0 |
| 23-Oct-10 | Chy Mnt | 9:30 | | | | Potentiometer changed to 8.0 |
| 23-Oct-10 | AR1 | 9:30 | 38° 42.158' N 104° 49.771' W | PTCH | 0.5 kg | Bottle empty Green Bottle Evaporation time: 35 minutes Wind: Almost none, 2 kt out of SW Light Overcast clouds |

Appendix B1

| | | | | | | | |
|--------------------------------|------|------|------|------|------|----|-----|
| Amb Bkd Isomer Conc, E-12g/scm | | oc | | 1- | | pt | |
| PDCB | PMCP | PMCH | PDCB | PTCH | PDCB | | |
| 27 | 128 | | 123 | 9.8 | 2.2 | | 119 |

| | | | | | | | |
|-------------------------|------|---------|------|---------|------|---------|--|
| Amb Bkd Conc, E-12g/scm | | total o | | total p | | total p | |
| PDCB | PMCP | PMCH | PDCB | PTCH | PDCB | | |
| 1.00 | 0.90 | | 0.97 | 0.457 | 0.60 | 0.55 | |

Final composition:

| Site # | Lat N | Lon W | Date | Start Time (Local) | Start Time (UTC - daylight saving time) | Stop Time (Local) | Stop Time (UTC - daylight saving time) | # | # | Est Sample | PFT Conc, E-12g/scm | | | PDCB | oPDCB | totPCH | |
|---------|-------|----------|-----------|--------------------|-----------------------------------------|-------------------|----------------------------------------|------|------|------------|---------------------|--------|---------|--------|----------|----------|----------|
| | | | | | | | | | | | PFT conc above bkd | | | | | | |
| B16 | 1A | 39.34872 | 105.17671 | 10/18/2010 | 1500 | 2100 | 1530 | 2130 | 1022 | 1 | 1.71 | 3.1 | 3.1382 | 3.1 | 3.138 | 3.138 | 0.000 |
| B16 | 1A | 39.34872 | 105.17671 | 10/18/2010 | 1530 | 2130 | 1600 | 2200 | 1022 | 2 | 1.76 | 2.7 | 3.1145 | -3.7 | 2.712 | 3.115 | 0.000 |
| B16 | 1A | 39.34872 | 105.17671 | 10/18/2010 | 1600 | 2200 | 1630 | 2230 | 1022 | 3 | 1.76 | -1.2 | 4.4492 | 2.9 | 0.000 | 4.449 | 2.885 |
| B16 | 1A | 39.34872 | 105.17671 | 10/18/2010 | 1630 | 2230 | 1700 | 2300 | 1022 | 4 | 1.73 | -0.1 | 7.1052 | 4.8 | 0.000 | 7.105 | 4.842 |
| B16 | 1A | 39.34872 | 105.17671 | 10/18/2010 | 1700 | 2300 | 1730 | 2330 | 1022 | 5 | 1.80 | 1.4 | 11.2799 | 3.2 | 1.403 | 11.280 | 3.153 |
| B16 | 1A | 39.34872 | 105.17671 | 10/18/2010 | 1730 | 2330 | 1800 | 2400 | 1022 | 6 | 1.78 | -0.7 | 4.6664 | 1.2 | 0.000 | 4.666 | 1.182 |
| B16 | 1A | 39.34872 | 105.17671 | 10/18/2010 | 1800 | 2400 | 1830 | 2430 | 1022 | 7 | 1.77 | 0.2 | 12.0556 | -3.7 | 0.164 | 12.056 | 0.000 |
| B1 | 2A | 39.2737 | 105.535 | 10/18/2010 | 1430 | 2030 | 1500 | 2100 | 1026 | 1 | 1.59 | 12.4 | 297.8 | 645.0 | 12.412 | 297.805 | 645.006 |
| B1 | 2A | 39.2737 | 105.535 | 10/18/2010 | 1500 | 2100 | 1530 | 2130 | 1026 | 2 | 1.63 | 6.3 | 1028.9 | 567.4 | 6.338 | 1028.857 | 567.389 |
| B1 | 2A | 39.2737 | 105.535 | 10/18/2010 | 1530 | 2130 | 1600 | 2200 | 1026 | 3 | 1.68 | 3.2 | 52.3 | 13.7 | 3.157 | 52.309 | 13.732 |
| B1 | 2A | 39.2737 | 105.535 | 10/18/2010 | 1600 | 2200 | 1630 | 2230 | 1026 | 4 | 1.72 | 14.8 | 20.5 | 7.5 | 14.804 | 20.538 | 7.541 |
| B1 | 2A | 39.2737 | 105.535 | 10/18/2010 | 1630 | 2230 | 1700 | 2300 | 1026 | 5 | 1.68 | 2.1 | 8.2 | 4.1 | 2.061 | 8.156 | 4.136 |
| B1 | 2A | 39.2737 | 105.535 | 10/18/2010 | 1700 | 2300 | 1730 | 2330 | 1026 | 6 | 1.87 | 1.4 | 1.5 | 4.3 | 1.393 | 1.496 | 4.298 |
| B1 | 2A | 39.2737 | 105.535 | 10/18/2010 | 1730 | 2330 | 1800 | 2400 | 1026 | 7 | 1.58 | 0.4 | 3.6 | 5.3 | 0.373 | 3.585 | 5.260 |
| B2 | 3A | 39.1295 | 104.7105 | 10/18/2010 | 1430 | 2030 | 1500 | 2100 | 1037 | 1 | 1.01 | 5.4 | 796.5 | 153.8 | 5.394 | 796.510 | 153.791 |
| B2 | 3A | 39.1295 | 104.7105 | 10/18/2010 | 1500 | 2100 | 1530 | 2130 | 1037 | 2 | 0.92 | -0.3 | 3864.8 | 58.6 | 0.000 | 3864.848 | 58.575 |
| B2 | 3A | 39.1295 | 104.7105 | 10/18/2010 | 1530 | 2130 | 1600 | 2200 | 1037 | 3 | 0.87 | -1.4 | 568.1 | 34.7 | 0.000 | 568.062 | 34.652 |
| B2 | 3A | 39.1295 | 104.7105 | 10/18/2010 | 1600 | 2200 | 1630 | 2230 | 1037 | 4 | 0.97 | -1.8 | 63.7 | 31.6 | 0.000 | 63.736 | 31.598 |
| B2 | 3A | 39.1295 | 104.7105 | 10/18/2010 | 1630 | 2230 | 1700 | 2300 | 1037 | 5 | 1.07 | -3.4 | 62.0 | 11.0 | 0.000 | 61.990 | 10.992 |
| B2 | 3A | 39.1295 | 104.7105 | 10/18/2010 | 1700 | 2300 | 1730 | 2330 | 1037 | 6 | 0.93 | -1.6 | 73.9 | 13.7 | 0.000 | 73.858 | 13.663 |
| B2 | 3A | 39.1295 | 104.7105 | 10/18/2010 | 1730 | 2330 | 1800 | 2400 | 1037 | 7 | 1.01 | -2.7 | 52.5 | 3.3 | 0.000 | 52.546 | 3.315 |
| B13 | 4A | 39.1536 | 105.14561 | 10/18/2010 | 1500 | 2100 | 1530 | 2130 | 1041 | 1 | 1.56 | 2.6 | 1184.2 | 4667.9 | 2.599 | 1184.183 | 4667.930 |
| B13 | 4A | 39.1536 | 105.14561 | 10/18/2010 | 1530 | 2130 | 1600 | 2200 | 1041 | 2 | 1.66 | 847.7 | 3959.9 | 1511.0 | 849.748 | 3959.884 | 1511.049 |
| B13 | 4A | 39.1536 | 105.14561 | 10/18/2010 | 1600 | 2200 | 1630 | 2230 | 1041 | 3 | 1.52 | 4289.1 | 2622.0 | 911.3 | 4289.137 | 2621.981 | 911.332 |
| B13 | 4A | 39.1536 | 105.14561 | 10/18/2010 | 1630 | 2230 | 1700 | 2300 | 1041 | 4 | 1.44 | 58.9 | 781.8 | 152.0 | 58.897 | 781.806 | 151.991 |
| B13 | 4A | 39.1536 | 105.14561 | 10/18/2010 | 1700 | 2300 | 1730 | 2330 | 1041 | 5 | 1.47 | 5.7 | 206.9 | 29.019 | 5.713 | 206.886 | 29.019 |
| B13 | 4A | 39.1536 | 105.14561 | 10/18/2010 | 1730 | 2330 | 1800 | 2400 | 1041 | 6 | 1.46 | -1.6 | 12.4 | 3.7 | 0.000 | 12.440 | 3.694 |
| B13 | 4A | 39.1536 | 105.14561 | 10/18/2010 | 1800 | 2400 | 1830 | 2430 | 1041 | 7 | 1.52 | -1.1 | 4.3 | 8.2 | 0.000 | 4.311 | 8.223 |
| B15-B16 | 5A | 39.30143 | 105.20465 | 10/18/2010 | 1500 | 2100 | 1530 | 2130 | 1009 | 1 | 0.80 | 9.1 | 18.6 | -3.7 | 9.084 | 18.559 | 0.000 |
| B15-B16 | 5A | 39.30143 | 105.20465 | 10/18/2010 | 1530 | 2130 | 1600 | 2200 | 1009 | 2 | 0.86 | 5.7 | 18.0 | 13.2 | 5.749 | 17.967 | 13.182 |
| B15-B16 | 5A | 39.30143 | 105.20465 | 10/18/2010 | 1600 | 2200 | 1630 | 2230 | 1009 | 3 | 1.02 | 8.7 | 12.4 | 13.0 | 8.694 | 12.377 | 13.966 |
| B15-B16 | 5A | 39.30143 | 105.20465 | 10/18/2010 | 1630 | 2230 | 1700 | 2300 | 1009 | 4 | 1.02 | 5.0 | 13.4 | 6.9 | 5.003 | 13.450 | 6.893 |
| B15-B16 | 5A | 39.30143 | 105.20465 | 10/18/2010 | 1700 | 2300 | 1730 | 2330 | 1009 | 5 | 1.10 | 6.5 | 10.5 | -3.7 | 6.540 | 10.495 | 0.000 |
| B15-B16 | 5A | 39.30143 | 105.20465 | 10/18/2010 | 1730 | 2330 | 1800 | 2400 | 1009 | 6 | 0.92 | 6.6 | 9.4 | -3.7 | 6.583 | 9.436 | 0.000 |
| B15-B16 | 5A | 39.30143 | 105.20465 | 10/18/2010 | 1800 | 2400 | 1830 | 2430 | 1009 | 7 | 0.84 | 6.5 | 14.1 | 12.7 | 6.490 | 14.130 | 12.706 |
| B15 | 6A | 39.25414 | 105.23259 | 10/18/2010 | 1500 | 2100 | 1530 | 2130 | 1010 | 1 | 1.69 | 47.0 | 19.8 | 4.2 | 47.033 | 19.814 | 4.209 |
| B15 | 6A | 39.25414 | 105.23259 | 10/18/2010 | 1530 | 2130 | 1600 | 2200 | 1010 | 2 | 1.47 | 0.9 | 4.5 | 7.5 | 0.945 | 4.477 | 7.493 |
| B15 | 6A | 39.25414 | 105.23259 | 10/18/2010 | 1600 | 2200 | 1630 | 2230 | 1010 | 3 | 1.51 | -1.3 | 16.4 | 11.5 | 0.000 | 16.379 | 11.508 |
| B15 | 6A | 39.25414 | 105.23259 | 10/18/2010 | 1630 | 2230 | 1700 | 2300 | 1010 | 4 | 1.68 | -1.3 | 9.8 | 7.8 | 0.000 | 9.760 | 7.828 |
| B15 | 6A | 39.25414 | 105.23259 | 10/18/2010 | 1700 | 2300 | 1730 | 2330 | 1010 | 5 | 1.55 | -0.9 | 10.0 | 6.0 | 0.000 | 10.013 | 6.025 |
| B15 | 6A | 39.25414 | 105.23259 | 10/18/2010 | 1730 | 2330 | 1800 | 2400 | 1010 | 6 | 1.61 | -1.6 | 8.8 | 0.3 | 0.000 | 8.776 | 0.291 |
| B15 | 7A | 39.25414 | 105.23259 | 10/18/2010 | 1500 | 2100 | 1530 | 2130 | 1019 | 1 | 1.43 | 2.7 | -0.3 | -3.7 | 2.673 | 0.000 | 0.000 |
| B15 | 7A | 39.25414 | 105.23259 | 10/18/2010 | 1530 | 2130 | 1600 | 2200 | 1019 | 2 | 1.54 | -0.1 | 0.4 | -3.7 | 0.000 | 0.436 | 0.000 |
| B15 | 7A | 39.25414 | 105.23259 | 10/18/2010 | 1600 | 2200 | 1630 | 2230 | 1019 | 3 | 1.44 | -1.0 | 11.0 | 13.6 | 0.000 | 10.988 | 13.551 |
| B15 | 7A | 39.25414 | 105.23259 | 10/18/2010 | 1630 | 2230 | 1700 | 2300 | 1019 | 4 | 1.57 | -1.1 | 3.6 | -3.7 | 0.000 | 3.609 | 0.000 |
| B15 | 7A | 39.25414 | 105.23259 | 10/18/2010 | 1700 | 2300 | 1730 | 2330 | 1019 | 5 | 1.58 | -1.7 | 4.4 | 0.4 | 0.000 | 4.413 | 0.405 |
| B15 | 7A | 39.25414 | 105.23259 | 10/18/2010 | 1730 | 2330 | 1800 | 2400 | 1019 | 6 | 1.56 | -1.6 | -0.5 | 0.8 | 0.000 | 0.000 | 0.766 |
| B15 | 7A | 39.25414 | 105.23259 | 10/18/2010 | 1800 | 2400 | 1830 | 2430 | 1019 | 7 | 1.61 | -0.6 | -0.9 | -3.7 | 0.000 | 0.000 | 0.000 |
| B3 | 8A | 39.126 | 104.91 | 10/18/2010 | 1330 | 1930 | 1400 | 2000 | 1033 | 1 | 1.54 | 14.3 | 60.8 | 337.1 | 14.271 | 60.793 | 337.129 |
| B3 | 8A | 39.126 | 104.91 | 10/18/2010 | 1400 | 2000 | 1430 | 2030 | 1033 | 2 | 1.56 | 6.4 | 868.3 | 550.5 | 6.428 | 868.256 | 550.528 |
| B3 | 8A | 39.126 | 104.91 | 10/18/2010 | 1430 | 2030 | 1500 | 2100 | 1033 | 3 | 1.72 | 2.4 | 2689.4 | 72.5 | 2.415 | 2689.445 | 72.475 |
| B3 | 8A | 39.126 | 104.91 | 10/18/2010 | 1500 | 2100 | 1530 | 2130 | 1033 | 4 | 1.53 | 130.8 | 793.4 | 30.8 | 130.764 | 793.446 | 30.753 |
| B3 | 8A | 39.126 | 104.91 | 10/18/2010 | 1530 | 2130 | 1600 | 2200 | 1033 | 5 | 1.55 | 2.9 | 13.4 | 22.9 | 2.903 | 13.435 | 22.903 |
| B3 | 8A | 39.126 | 104.91 | 10/18/2010 | 1600 | 2200 | 1630 | 2230 | 1033 | 6 | 0.60 | 0.6 | 8.5 | 11.2 | 0.571 | 8.526 | 11.208 |
| B3 | 8A | 39.126 | 104.91 | 10/18/2010 | 1630 | 2230 | 1700 | 2300 | 1033 | 7 | 1.65 | 0.0 | 13.3 | 18.4 | 0.000 | 13.271 | 18.360 |
| Mobile | M1A | 39.9586 | 104.6806 | 10/18/2010 | 1500 | 2100 | 1530 | 2130 | 1038 | 1 | 1.30 | -1.5 | 289.0 | 1643.6 | 0.000 | 289.033 | 1643.625 |
| Mobile | M1A | 39.9586 | 104.6806 | 10/18/2010 | 1530 | 2130 | 1600 | 2200 | 1038 | 2 | 1.26 | 107.1 | 1925.3 | 1101.6 | 107.140 | 1925.313 | 1101.602 |
| Mobile | M1A | 39.9586 | 104.6806 | 10/18/2010 | 1600 | 2200 | 1630 | 2230 | 1038 | 3 | 1.27 | 805.3 | 940.6 | 373.1 | 805.359 | 940.772 | 373.107 |
| Mobile | M1A | 39.9586 | 104.6806 | 10/18/2010 | | | | | | | | | | | | | |

Appendix B2

| Amb Bkd Isomer Conc, E-12g/scm | | | | | |
|--------------------------------|------|------|-----|-----|-----|
| PDCB | PMCP | PMCH | oc | 1- | pt |
| 27 | 126 | 123 | 9.8 | 2.2 | 118 |

| Amb Bkd Conc, E-12g/scm | | | | | |
|-------------------------|------|------|---------|---------|---------|
| PDCB | PMCP | PMCH | total o | total p | total p |
| f.00 | 0.90 | 0.97 | 0.451 | 0.60 | 0.55 |
| 27 | 140 | 127 | 21.8 | 3.7 | 216 |

Fractional composition

| Site # | Location | Lat N | Lon W | Date | Start Time (Local) | Start Time (UTC) | Slop Time (Local) | Stop Time (UTC) | # | # | Est Sample | PFT Conc, E-12g/scm | | | | | | | | |
|---------|----------|----------|-----------|------------|--------------------|------------------|-------------------|-----------------|------|----|------------|---------------------|--------|--------|----------|----------|----------|--------|--|--|
| | | | | | | | | | | | | PFT conc above bkd | | | | | | | | |
| | | | | | | | | | | | | Vol, L | PDCB | oPDCB | totPCH | PDCB | oPDCB | totPCH | | |
| 22 | 1B | 39.12690 | 105.10523 | 10/21/2010 | 1300 | 1900 | 1330 | 1930 | 1022 | 9 | 1.71 | 7.4 | 5.5 | -3.7 | 7.362183 | 5.471065 | 0 | | | |
| 22 | 1B | 39.12690 | 105.10523 | 10/21/2010 | 1300 | 1900 | 1400 | 2000 | 1022 | 10 | 1.72 | 6.1 | 6.6 | -3.7 | 6.084003 | 6.601325 | 0 | | | |
| 22 | 1B | 39.12690 | 105.10523 | 10/21/2010 | 1400 | 2000 | 1430 | 2030 | 1022 | 11 | 1.72 | 6.5 | 9.0 | -3.7 | 6.502963 | 9.033192 | 0 | | | |
| 22 | 1B | 39.12690 | 105.10523 | 10/21/2010 | 1430 | 2030 | 1500 | 2100 | 1022 | 12 | 1.68 | 4.7 | 10.2 | -3.7 | 4.689041 | 10.23641 | 0 | | | |
| 22 | 1B | 39.12690 | 105.10523 | 10/21/2010 | 1500 | 2100 | 1530 | 2130 | 1022 | 13 | 1.64 | 153.7 | 412.6 | -3.7 | 153.7478 | 412.8069 | 0 | | | |
| 22 | 1B | 39.12690 | 105.10523 | 10/21/2010 | 1530 | 2130 | 1600 | 2200 | 1022 | 14 | 1.74 | 356.6 | 1890.5 | 7.3 | 356.6387 | 1890.514 | 7.271318 | | | |
| 22 | 1B | 39.12690 | 105.10523 | 10/21/2010 | 1600 | 2200 | 1630 | 2230 | 1022 | 15 | 1.68 | 34.1 | 632.1 | 3.3 | 34.11233 | 632.0658 | 3.261935 | | | |
| B4 | 2B | 39.27035 | 104.736 | 10/21/2010 | 1330 | 1930 | 1400 | 2000 | 1024 | 9 | 1.16 | 2.2 | 3.9 | -3.7 | 2.176869 | 3.850915 | 0 | | | |
| B4 | 2B | 39.27035 | 104.736 | 10/21/2010 | 1400 | 2000 | 1430 | 2030 | 1024 | 10 | 0.98 | 3.5 | 4.0 | -3.7 | 3.488439 | 3.982751 | 0 | | | |
| B4 | 2B | 39.27035 | 104.736 | 10/21/2010 | 1430 | 2030 | 1500 | 2100 | 1024 | 11 | 1.10 | 5.3 | 0.2 | -3.7 | 5.259531 | 0.209593 | 0 | | | |
| B4 | 2B | 39.27035 | 104.736 | 10/21/2010 | 1500 | 2100 | 1530 | 2130 | 1024 | 12 | 0.99 | 2.8 | 4.0 | -3.7 | 2.844658 | 4.030817 | 0 | | | |
| B4 | 2B | 39.27035 | 104.736 | 10/21/2010 | 1530 | 2130 | 1600 | 2200 | 1024 | 13 | 1.11 | 2.8 | 3.7 | -3.7 | 2.789287 | 3.734364 | 0 | | | |
| B4 | 2B | 39.27035 | 104.736 | 10/21/2010 | 1600 | 2200 | 1630 | 2230 | 1024 | 14 | 1.00 | 2.4 | 6.0 | -3.7 | 2.41786 | 6.070307 | 0 | | | |
| B4 | 2B | 39.27035 | 104.736 | 10/21/2010 | 1630 | 2230 | 1700 | 2300 | 1024 | 15 | 1.02 | 4.7 | 2.6 | -3.7 | 4.660501 | 2.64613 | 0 | | | |
| B1 | 3B | 39.2736 | 105.535 | 10/21/2010 | 1330 | 1930 | 1400 | 2000 | 1026 | 9 | 1.54 | 1.4 | 2.4 | 5.4 | 1.435203 | 2.375143 | 5.358426 | | | |
| B1 | 3B | 39.2736 | 105.535 | 10/21/2010 | 1400 | 2000 | 1430 | 2030 | 1026 | 10 | 1.61 | 0.3 | 2.4 | -3.7 | 0.346598 | 2.403946 | 0 | | | |
| B1 | 3B | 39.2736 | 105.535 | 10/21/2010 | 1430 | 2030 | 1500 | 2100 | 1026 | 11 | 1.56 | 4.1 | 0.6 | -3.7 | 4.061859 | 0.61918 | 0 | | | |
| B1 | 3B | 39.2736 | 105.535 | 10/21/2010 | 1500 | 2100 | 1530 | 2130 | 1026 | 12 | 1.17 | 2.4 | 4.2 | -3.7 | 2.402452 | 4.152771 | 0 | | | |
| B1 | 3B | 39.2736 | 105.535 | 10/21/2010 | 1530 | 2130 | 1600 | 2200 | 1026 | 13 | 1.52 | 2.7 | 4.8 | -3.7 | 2.679372 | 4.836265 | 0 | | | |
| B1 | 3B | 39.2736 | 105.535 | 10/21/2010 | 1600 | 2200 | 1630 | 2230 | 1026 | 14 | 1.56 | 8.3 | 34.1 | -3.7 | 8.347479 | 34.13597 | 0 | | | |
| B1 | 3B | 39.2736 | 105.535 | 10/21/2010 | 1630 | 2230 | 1700 | 2300 | 1026 | 15 | 1.72 | 19.8 | 42.3 | 5.6 | 19.60266 | 42.33638 | 5.647646 | | | |
| B2 | 4B | 39.23 | 104.8865 | 10/21/2010 | 1330 | 1930 | 1400 | 2000 | 1037 | 9 | 1.09 | -7.9 | 75.3 | 10.1 | 0 | 75.26256 | 10.13809 | 0 | | |
| B2 | 4B | 39.23 | 104.8865 | 10/21/2010 | 1400 | 2000 | 1430 | 2030 | 1037 | 10 | 1.16 | -5.6 | 64.4 | -3.7 | 0 | 64.39053 | 0 | | | |
| B2 | 4B | 39.23 | 104.8865 | 10/21/2010 | 1430 | 2030 | 1500 | 2100 | 1037 | 11 | 1.01 | -2.9 | 65.4 | 5.9 | 0 | 65.41945 | 5.8989 | 0 | | |
| B2 | 4B | 39.23 | 104.8865 | 10/21/2010 | 1500 | 2100 | 1530 | 2130 | 1037 | 12 | 0.98 | -3.1 | 73.5 | -3.7 | 2.121094 | 4378.636 | 5.36321 | | | |
| B2 | 4B | 39.23 | 104.8865 | 10/21/2010 | 1530 | 2130 | 1600 | 2200 | 1037 | 13 | 0.99 | -4.3 | 96.5 | 6.8 | 0 | 96.45977 | 6.809722 | 0 | | |
| B2 | 4B | 39.23 | 104.8865 | 10/21/2010 | 1600 | 2200 | 1630 | 2230 | 1037 | 14 | 1.01 | -4.3 | 65.1 | -3.7 | 0 | 65.11715 | 0 | | | |
| B2 | 4B | 39.23 | 104.8865 | 10/21/2010 | 1630 | 2230 | 1700 | 2300 | 1037 | 15 | 1.14 | -7.9 | 68.5 | 10.8 | 0 | 68.47036 | 10.83238 | 0 | | |
| Site 26 | 5B | 39.02947 | 105.16478 | 10/21/2010 | 1312 | 1912 | 1342 | 1942 | 1041 | 9 | 1.33 | 23.3 | 4.4 | -3.7 | 23.27339 | 4.432508 | 0 | | | |
| Site 26 | 5B | 39.02947 | 105.16478 | 10/21/2010 | 1342 | 1942 | 1412 | 2012 | 1041 | 10 | 1.32 | 30.0 | 3.7 | 6.3 | 30.03338 | 3.651676 | 6.280917 | | | |
| Site 26 | 5B | 39.02947 | 105.16478 | 10/21/2010 | 1412 | 2012 | 1442 | 2042 | 1041 | 11 | 1.39 | 9.9 | 10.2 | -3.7 | 9.855041 | 10.17115 | 0 | | | |
| Site 26 | 5B | 39.02947 | 105.16478 | 10/21/2010 | 1442 | 2042 | 1512 | 2112 | 1041 | 12 | 1.42 | 243.6 | 2021.8 | 7.8 | 243.6145 | 2021.8 | 7.765084 | | | |
| Site 26 | 5B | 39.02947 | 105.16478 | 10/21/2010 | 1512 | 2112 | 1542 | 2142 | 1041 | 13 | 1.41 | 21270.9 | 4378.6 | 5.4 | 21270.94 | 4378.636 | 5.36321 | | | |
| Site 26 | 5B | 39.02947 | 105.16478 | 10/21/2010 | 1542 | 2142 | 1612 | 2212 | 1041 | 14 | 1.32 | 10377.0 | 2113.4 | 1070.9 | 10377.03 | 2113.415 | 1070.861 | | | |
| Site 26 | 5B | 39.02947 | 105.16478 | 10/21/2010 | 1612 | 2212 | 1642 | 2242 | 1041 | 15 | 1.31 | 2275.7 | 510.8 | -3.7 | 2275.71 | 510.8092 | 0 | | | |
| Ad hoc | 6B | 39.24172 | 105.26135 | 10/21/2010 | 1330 | 1930 | 1400 | 2000 | 1009 | 9 | 0.84 | 7.7 | 19.0 | -3.7 | 7.692701 | 18.99011 | 0 | | | |
| Ad hoc | 6B | 39.24172 | 105.26135 | 10/21/2010 | 1400 | 2000 | 1430 | 2030 | 1009 | 10 | 0.83 | 9.5 | 16.1 | -3.7 | 9.478182 | 16.14163 | 0 | | | |
| Ad hoc | 6B | 39.24172 | 105.26135 | 10/21/2010 | 1430 | 2030 | 1500 | 2100 | 1009 | 11 | 0.79 | 29.7 | 24.8 | -3.7 | 29.66868 | 24.80042 | 0 | | | |
| Ad hoc | 6B | 39.24172 | 105.26135 | 10/21/2010 | 1500 | 2100 | 1530 | 2130 | 1009 | 12 | 0.82 | 11.1 | 18.4 | -3.7 | 11.10621 | 18.36532 | 0 | | | |
| Ad hoc | 6B | 39.24172 | 105.26135 | 10/21/2010 | 1530 | 2130 | 1600 | 2200 | 1009 | 13 | 0.88 | 9.7 | 20.9 | 1.2 | 9.681304 | 20.93222 | 1.170769 | | | |
| Ad hoc | 6B | 39.24172 | 105.26135 | 10/21/2010 | 1600 | 2200 | 1630 | 2230 | 1009 | 14 | 0.86 | 46.7 | 113.4 | 14.2 | 46.70403 | 113.3504 | 14.2138 | | | |
| Ad hoc | 6B | 39.24172 | 105.26135 | 10/21/2010 | 1630 | 2230 | 1700 | 2300 | 1009 | 15 | 0.83 | 273.8 | 1333.4 | -3.7 | 273.8144 | 1333.42 | 0 | | | |
| Ad hoc | 7B | 39.12764 | 105.25748 | 10/21/2010 | 1330 | 1930 | 1400 | 2000 | 1010 | 9 | 1.41 | 12.3 | 8.3 | 9.9 | 12.3061 | 8.304025 | 9.946162 | | | |
| Ad hoc | 7B | 39.12764 | 105.25748 | 10/21/2010 | 1400 | 2000 | 1430 | 2030 | 1010 | 10 | 1.53 | 18.1 | 5.1 | -3.7 | 18.09963 | 5.087221 | 0 | | | |
| Ad hoc | 7B | 39.12764 | 105.25748 | 10/21/2010 | 1430 | 2030 | 1500 | 2100 | 1010 | 11 | 1.45 | 8.2 | 10.9 | -3.7 | 8.219643 | 10.86564 | 0 | | | |
| Ad hoc | 7B | 39.12764 | 105.25748 | 10/21/2010 | 1500 | 2100 | 1530 | 2130 | 1010 | 12 | 1.47 | 25.9 | 35.0 | -3.7 | 25.89842 | 35.03653 | 0 | | | |
| Ad hoc | 7B | 39.12764 | 105.25748 | 10/21/2010 | 1530 | 2130 | 1600 | 2200 | 1010 | 13 | 1.57 | 946.2 | 2661.2 | 3.6 | 946.2322 | 2661.151 | 3.64542 | | | |
| Ad hoc | 7B | 39.12764 | 105.25748 | 10/21/2010 | 1600 | 2200 | 1630 | 2230 | 1010 | 14 | 1.68 | 4707.2 | 4816.6 | 4.4 | 4707.235 | 4816.561 | 4.419882 | | | |
| Ad hoc | 7B | 39.12764 | 105.25748 | 10/21/2010 | 1630 | 2230 | 1700 | 2300 | 1010 | 15 | 1.53 | 3929.9 | 2199.0 | 48.6 | 3929.915 | 2199.049 | 48.5865 | | | |
| B24 | 8B | 39.0188 | 105.2682 | 10/21/2010 | 1300 | 1900 | 1330 | 1930 | 1011 | 9 | 1.04 | 4.1 | 4.1 | -3.7 | 4.12143 | 4.08108 | 0 | | | |
| B24 | 8B | 39.0188 | 105.2682 | 10/21/2010 | 1330 | 1930 | 1400 | 2000 | 1011 | 10 | 1.02 | 4.2 | 8.9 | 5.1 | 4.162205 | 8.925587 | 5.099256 | | | |
| B24 | 8B | 39.0188 | 105.2682 | 10/21/2010 | 1400 | 2000 | 1430 | 2030 | 1011 | 11 | 0.95 | 5.3 | 10.2 | -3.7 | 5.278021 | 10.17311 | 0 | | | |
| B24 | 8B | 39.0188 | 105.2682 | 10/21/2010 | 1430 | 2030 | 1500 | 2100 | 1011 | 12 | 0.90 | 6.9 | 11.7 | -3.7 | 6.916338 | 11.7321 | 0 | | | |
| B24 | 8B | 39.0188 | 105.2682 | 10/21/2010 | 1500 | 2100 | 1530 | 2130 | 1011 | 13 | 1.04 | 2.4 | 3.5 | -3.7 | 2.442072 | 3.524213 | 0 | | | |
| B24 | 8B | 39.0188 | 105.2682 | 10/21/2010 | 1530 | 2130 | 1600 | 2200 | 1011 | 14 | 0.92 | 5.6 | 34.3 | -3.7 | 5.607389 | 34.31604 | 0 | | | |
| B24 | 8B | 39.0188 | 105.2682 | 10/21/2010 | 1600 | 2200 | 1630 | 2230 | 1011 | 15 | 1.12 | 13965.8 | 2621.4 | -3.7 | 13965.84 | 2621.357 | 0 | | | |
| Ad hoc | 9B | 38.9237 | 105.2824 | 10/21/2010 | 1300 | 1900 | 1330 | 1930 | 1033 | 9 | 1.49 | -1.1 | 9.3 | -3.7 | 0 | 9.271054 | 0 | | | |
| Ad hoc | 9B | 38.9237 | 105.2824 | 10/21/2010 | 1330 | 1930 | 1400 | 2000 | 1033 | 10 | 1.57 | -1.0 | 10.1 | -3.7 | 0 | 10.67458 | 0 | | | |
| Ad hoc | 9B | 38.9237 | 105.2824 | 10/21/2010 | 1400 | 2000 | 1430 | 2030 | 1033 | 11 | 1.51 | -1.8 | 8.4 | 0.5 | 0 | 8.370092 | 0.474599 | 0 | | |
| Ad hoc | 9B | 38.9237 | 105.2824 | 10/21/2010 | 1430 | 2030 | 1500 | 2100 | 1033 | 12 | 1.59 | -2.7 | 10.1 | -3.7 | 0 | 10.0901 | 0 | | | |
| Ad hoc | 9B | 38.9237 | 105.2824 | 10/21/2010 | 1500 | 2100 | 1530 | 2130 | 1033 | 13 | 1.50 | -2.4 | 5.4 | 6.6 | 0 | 5.353031 | 6.575653 | 0 | | |
| Ad hoc | 9B | 38.92 | | | | | | | | | | | | | | | | | | |

Appendix B3

| Amb Bkd Isomer Conc. E-12g/scm | | sc | | 1- | | µ | |
|--------------------------------|------|------|------|------|------|------|------|
| PDCB | PMCP | PMCH | PDCH | PTCH | PDCH | PTCH | PDCH |
| 27 | 128 | 123 | 9.8 | 2.2 | 118 | | |

| Amb Bkd Conc. E-12g/scm | | total o | | total p | | total p | |
|-------------------------|------|---------|-------|---------|------|------------------------|------|
| PDCB | PMCP | PMCH | PDCH | PTCH | PDCH | PTCH | PDCH |
| 1.60 | 0.90 | 1.27 | 21.8 | 3.7 | 216 | | |
| | | 0.97 | 0.451 | 0.60 | 0.58 | Fractional composition | |

| Site # | Location | Lat N | Lon W | Date | Start Time (Local) | Start Time (UTC) | Stop Time (Local) | Stop Time (UTC) | # | # | Est PFT Conc, E-12g/scm | | | | |
|--------|----------|----------|-----------|------------|--------------------|------------------|-------------------|-----------------|------|----|-------------------------|--------------------|--------|------|-------|
| | | | | | | | | | | | Sample | PFT conc above bkd | Vol, L | PDCB | oPDCB |
| C1 | 1C | 38.27409 | 104.45777 | 10/23/2010 | 1000 | 1600 | 1030 | 1630 | 1022 | 17 | 1.79 | 1.0 | 8.8 | 2.6 | |
| C1 | 1C | 38.27409 | 104.45777 | 10/23/2010 | 1030 | 1630 | 1100 | 1700 | 1022 | 18 | 1.76 | -0.2 | 10.4 | -3.7 | |
| C1 | 1C | 38.27409 | 104.45777 | 10/23/2010 | 1100 | 1700 | 1130 | 1730 | 1022 | 19 | 1.72 | 0.9 | 9.1 | -3.7 | |
| C1 | 1C | 38.27409 | 104.45777 | 10/23/2010 | 1100 | 1730 | 1200 | 1800 | 1022 | 20 | 1.76 | 0.1 | 7.8 | -3.7 | |
| C1 | 1C | 38.27409 | 104.45777 | 10/23/2010 | 1200 | 1800 | 1230 | 1830 | 1022 | 21 | 1.80 | 0.2 | 11.8 | -3.7 | |
| C1 | 1C | 38.27409 | 104.45777 | 10/23/2010 | 1230 | 1830 | 1300 | 1900 | 1022 | 22 | 1.72 | 0.6 | 26.3 | 7.5 | |
| C1 | 1C | 38.27409 | 104.45777 | 10/23/2010 | 1300 | 1900 | 1330 | 1930 | 1022 | 23 | 1.71 | 18.9 | 75.8 | 1.1 | |
| B14 | 2C | 38.5519 | 104.1834 | 10/23/2010 | 1000 | 1600 | 1030 | 1630 | 1024 | 17 | 1.05 | 5.0 | 6.4 | 5.9 | |
| B14 | 2C | 38.5519 | 104.1834 | 10/23/2010 | 1030 | 1630 | 1100 | 1700 | 1024 | 18 | 1.08 | 5.8 | 4.7 | -3.7 | |
| B14 | 2C | 38.5519 | 104.1834 | 10/23/2010 | 1100 | 1700 | 1130 | 1730 | 1024 | 19 | 1.08 | 5.2 | 2.6 | -3.7 | |
| B14 | 2C | 38.5519 | 104.1834 | 10/23/2010 | 1130 | 1730 | 1200 | 1800 | 1024 | 20 | 1.03 | 60.3 | 5.9 | 3.8 | |
| B14 | 2C | 38.5519 | 104.1834 | 10/23/2010 | 1200 | 1800 | 1230 | 1830 | 1024 | 21 | 0.97 | 57.9 | 10.5 | -3.7 | |
| B14 | 2C | 38.5519 | 104.1834 | 10/23/2010 | 1230 | 1830 | 1300 | 1900 | 1024 | 22 | 1.10 | 7.3 | 5.4 | -3.7 | |
| B14 | 2C | 38.5519 | 104.1834 | 10/23/2010 | 1300 | 1900 | 1330 | 1930 | 1024 | 23 | 0.93 | 6.4 | 5.8 | 12.2 | |
| C7 | 3C | 38.3383 | 104.5793 | 10/23/2010 | 1000 | 1600 | 1030 | 1630 | 1026 | 17 | 1.61 | 1.3 | 5.2 | -3.7 | |
| C7 | 3C | 38.3383 | 104.5793 | 10/23/2010 | 1030 | 1630 | 1100 | 1700 | 1026 | 18 | 1.64 | 3.4 | 4.7 | -3.7 | |
| C7 | 3C | 38.3383 | 104.5793 | 10/23/2010 | 1100 | 1700 | 1130 | 1730 | 1026 | 19 | 1.61 | 0.3 | 2.8 | -3.7 | |
| C7 | 3C | 38.3383 | 104.5793 | 10/23/2010 | 1130 | 1730 | 1200 | 1800 | 1026 | 20 | 1.67 | 0.5 | 2.7 | -3.7 | |
| C7 | 3C | 38.3383 | 104.5793 | 10/23/2010 | 1200 | 1800 | 1230 | 1830 | 1026 | 21 | 1.55 | -1.1 | 8.0 | 5.6 | |
| C7 | 3C | 38.3383 | 104.5793 | 10/23/2010 | 1230 | 1830 | 1300 | 1900 | 1026 | 22 | 1.04 | 1.4 | -7.0 | -3.7 | |
| C7 | 3C | 38.3383 | 104.5793 | 10/23/2010 | 1300 | 1900 | 1400 | 2000 | 1026 | 23 | 1.49 | 1.7 | 29.3 | 6.8 | |
| B12 | 4C | 38.6948 | 104.1821 | 10/23/2010 | 1000 | 1600 | 1030 | 1630 | 1037 | 17 | 1.15 | -6.7 | 70.9 | 8.4 | |
| B12 | 4C | 38.6948 | 104.1821 | 10/23/2010 | 1030 | 1630 | 1100 | 1700 | 1037 | 18 | 0.77 | -2.6 | 81.4 | -3.7 | |
| B12 | 4C | 38.6948 | 104.1821 | 10/23/2010 | 1100 | 1700 | 1130 | 1730 | 1037 | 19 | 0.96 | -6.3 | 86.5 | 7.5 | |
| B12 | 4C | 38.6948 | 104.1821 | 10/23/2010 | 1130 | 1730 | 1200 | 1800 | 1037 | 20 | 0.97 | -6.5 | 81.5 | 7.9 | |
| B12 | 4C | 38.6948 | 104.1821 | 10/23/2010 | 1200 | 1800 | 1230 | 1830 | 1037 | 21 | 0.96 | -4.5 | 80.2 | -3.7 | |
| B12 | 4C | 38.6948 | 104.1821 | 10/23/2010 | 1230 | 1830 | 1300 | 1900 | 1037 | 22 | 0.92 | -3.3 | 58.3 | 7.3 | |
| B12 | 4C | 38.6948 | 104.1821 | 10/23/2010 | 1300 | 1900 | 1400 | 2000 | 1037 | 23 | 0.92 | 5.0 | 8.6 | -3.7 | |
| C5 | 5C | 38.2167 | 104.5409 | 10/23/2010 | 1000 | 1600 | 1030 | 1630 | 1038 | 17 | 1.42 | -12.8 | 72.0 | 4.6 | |
| C5 | 5C | 38.2167 | 104.5409 | 10/23/2010 | 1030 | 1630 | 1100 | 1700 | 1038 | 18 | 1.45 | -9.9 | 39.7 | 9.5 | |
| C5 | 5C | 38.2167 | 104.5409 | 10/23/2010 | 1100 | 1700 | 1130 | 1730 | 1038 | 19 | 1.39 | -7.6 | 37.4 | 6.4 | |
| C5 | 5C | 38.2167 | 104.5409 | 10/23/2010 | 1130 | 1730 | 1200 | 1800 | 1038 | 20 | 0.49 | -16.6 | 196.1 | 26.0 | |
| C5 | 5C | 38.2167 | 104.5409 | 10/23/2010 | 1200 | 1800 | 1230 | 1830 | 1038 | 21 | 1.57 | 81.9 | 322.4 | 34.0 | |
| C5 | 5C | 38.2167 | 104.5409 | 10/23/2010 | 1230 | 1830 | 1300 | 1900 | 1038 | 22 | 1.54 | 245.4 | 843.1 | 45.7 | |
| C5 | 5C | 38.2167 | 104.5409 | 10/23/2010 | 1300 | 1900 | 1330 | 1930 | 1038 | 23 | 1.60 | 40.7 | 225.3 | 64.0 | |
| C3 | 6C | 38.4241 | 104.1851 | 10/23/2010 | 1000 | 1600 | 1030 | 1630 | 1041 | 17 | 1.56 | 0.1 | 3.8 | 0.7 | |
| C3 | 6C | 38.4241 | 104.1851 | 10/23/2010 | 1030 | 1630 | 1100 | 1700 | 1041 | 18 | 1.54 | -1.0 | 3.7 | 4.6 | |
| C3 | 6C | 38.4241 | 104.1851 | 10/23/2010 | 1100 | 1700 | 1130 | 1730 | 1041 | 19 | 1.57 | 0.2 | 3.0 | -3.7 | |
| C3 | 6C | 38.4241 | 104.1851 | 10/23/2010 | 1130 | 1730 | 1200 | 1800 | 1041 | 20 | 1.60 | -0.7 | 2.9 | -3.7 | |
| C3 | 6C | 38.4241 | 104.1851 | 10/23/2010 | 1200 | 1800 | 1230 | 1830 | 1041 | 21 | 1.48 | 14.1 | 3.3 | 4.7 | |
| C3 | 6C | 38.4241 | 104.1851 | 10/23/2010 | 1230 | 1830 | 1300 | 1900 | 1041 | 22 | 1.55 | 515.5 | 11.2 | 6.3 | |
| C3 | 6C | 38.4241 | 104.1851 | 10/23/2010 | 1300 | 1900 | 1330 | 1930 | 1041 | 23 | 1.58 | 573.9 | 14.8 | 4.4 | |
| C2 | 7C | 38.6369 | 104.183 | 10/23/2010 | 1000 | 1600 | 1030 | 1630 | 1009 | 17 | 0.79 | 10.0 | 15.7 | -3.7 | |
| C2 | 7C | 38.6369 | 104.183 | 10/23/2010 | 1030 | 1630 | 1100 | 1700 | 1009 | 18 | 0.83 | 8.6 | 17.7 | -3.7 | |
| C2 | 7C | 38.6369 | 104.183 | 10/23/2010 | 1100 | 1700 | 1130 | 1730 | 1009 | 19 | 0.88 | 7.7 | 16.1 | -3.7 | |
| C2 | 7C | 38.6369 | 104.183 | 10/23/2010 | 1130 | 1730 | 1200 | 1800 | 1009 | 20 | 0.89 | 10.5 | 19.0 | 9.7 | |
| C2 | 7C | 38.6369 | 104.183 | 10/23/2010 | 1200 | 1800 | 1230 | 1830 | 1009 | 21 | 0.86 | 10.0 | 13.3 | -3.7 | |
| C2 | 7C | 38.6369 | 104.183 | 10/23/2010 | 1230 | 1830 | 1300 | 1900 | 1009 | 22 | 0.85 | 16.5 | 19.2 | -3.7 | |
| C2 | 7C | 38.6369 | 104.183 | 10/23/2010 | 1300 | 1900 | 1330 | 1930 | 1009 | 23 | 0.80 | 11.8 | 16.3 | -3.7 | |
| C7 | 8C | 38.16154 | 104.64536 | 10/23/2010 | 1000 | 1600 | 1030 | 1630 | 1010 | 17 | 1.59 | 2.2 | 12.0 | 8.3 | |
| C7 | 8C | 38.16154 | 104.64536 | 10/23/2010 | 1030 | 1630 | 1100 | 1700 | 1010 | 18 | 1.57 | -0.5 | 10.3 | 5.3 | |
| C7 | 8C | 38.16154 | 104.64536 | 10/23/2010 | 1100 | 1700 | 1130 | 1730 | 1010 | 19 | 1.51 | 0.9 | 8.9 | -3.7 | |
| C7 | 8C | 38.16154 | 104.64536 | 10/23/2010 | 1130 | 1730 | 1200 | 1800 | 1010 | 20 | 1.54 | 1.2 | 7.4 | 8.1 | |
| C7 | 8C | 38.16154 | 104.64536 | 10/23/2010 | 1200 | 1800 | 1230 | 1830 | 1010 | 21 | 1.56 | -0.1 | 9.0 | 5.0 | |
| C7 | 8C | 38.16154 | 104.64536 | 10/23/2010 | 1230 | 1830 | 1300 | 1900 | 1010 | 22 | 1.49 | 8.5 | 11.1 | -3.7 | |
| C7 | 8C | 38.16154 | 104.64536 | 10/23/2010 | 1300 | 1900 | 1330 | 1930 | 1010 | 23 | 1.19 | 5.8 | 14.4 | 8.5 | |
| B20 | 9C | 38.3634 | 104.2769 | 10/23/2010 | 1000 | 1600 | 1030 | 1630 | 1011 | 17 | 1.28 | 5.7 | 4.7 | 4.8 | |
| B20 | 9C | 38.3634 | 104.2769 | 10/23/2010 | 1030 | 1630 | 1100 | 1700 | 1011 | 18 | 0.93 | 7.6 | 8.0 | -3.7 | |
| B20 | 9C | 38.3634 | 104.2769 | 10/23/2010 | 1100 | 1700 | 1130 | 1730 | 1011 | 19 | 1.13 | 3.0 | 3.0 | -3.7 | |
| B20 | 9C | 38.3634 | 104.2769 | 10/23/2010 | 1130 | 1730 | 1200 | 1800 | 1011 | 20 | 0.88 | 3.3 | 9.8 | 13.2 | |
| B20 | 9C | 38.3634 | 104.2769 | 10/23/2010 | 1200 | 1800 | 1230 | 1830 | 1011 | 21 | 1.03 | 2.5 | 6.5 | -3.7 | |
| B20 | 9C | 38.3634 | 104.2769 | 10/23/2010 | 1230 | 1830 | 1300 | 1900 | 1011 | 22 | 0.94 | 10.1 | 7.4 | 8.9 | |
| B20 | 9C | 38.3634 | 104.2769 | 10/23/2010 | 1300 | 1900 | 1330 | 1930 | 1011 | 23 | 0.98 | 351.0 | 27.9 | -3.7 | |
| C4 | 10C | 38.267 | 104.275 | 10/23/2010 | 1049 | 1649 | 1119 | 1719 | 1033 | 17 | 1.60 | -0.7 | 8.2 | -3.7 | |
| C4 | 10C | 38.267 | 104.275 | 10/24/2010 | 1119 | 1719 | 1149 | 1749 | 1033 | 18 | 1.58 | -1.0 | 6.1 | -3.7 | |
| C4 | 10C | 38.267 | 104.275 | 10/25/2010 | 1149 | 1749 | 1219 | 1819 | 1033 | 19 | 1.55 | 0.4 | 5.3 | -3.7 | |
| C4 | 10C | 38.267 | 104.275 | 10/26/2010 | 1219 | 1819 | 1239 | 1839 | 1033 | 20 | 1.63 | -1.4 | 13.3 | 3.4 | |
| C7 | 11C | 38.16154 | 104.64536 | 10/23/2010 | 1000 | 1600 | 1030 | 1630 | 1019 | 17 | 1.50 | 3.3 | 3.1 | -3.7 | |
| C7 | 11C | 38.16154 | 104.64536 | 10/23/2010 | 1030 | 1630 | 1100 | 1700 | 1019 | 18 | 1.40 | 1.9 | 2.7 | 0.1 | |
| C7 | 11C | 38.16154 | 104.64536 | 10/23/2010 | 1100 | 1700 | 1130 | 1730 | 1019 | 19 | 1.47 | 2.7 | 0.6 | 7.1 | |
| C7 | 11C | 38.16154 | 104.64536 | 10/23/2010 | 1130 | 1730 | 1200 | 1800 | 1019 | 20 | 1.38 | 1.9 | 0.9 | -3.7 | |
| C7 | 11C | | | | | | | | | | | | | | |