***WAAS Technical Report***
***William J. Hughes Technical Center***
***Pomona, New Jersey***
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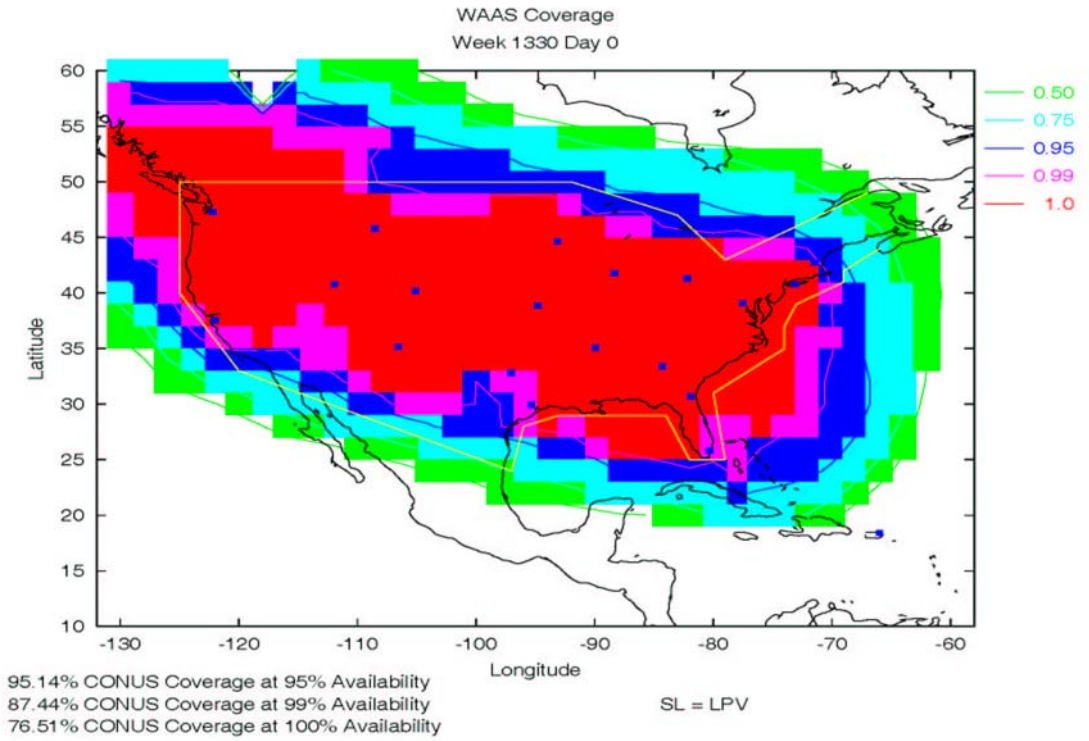
***DR#11: Localized loss of availability due to two IGP's (100W, 30N) & (100W, 25N) being set to storm state***
***GPS Week/Day: Week 1330 Day 0 (7/3/2005)***

**Discussion:**

On Day 0 of Week 1330 loss of LPV service availability was observed on daily coverage plots in the vicinity of the WRS at Houston TX. This corresponded to an LPV service outage observed at the Houston WRS receiver on this date.

The loss of LPV service availability in the CONUS coverage volume can be observed in Figure 1 in the south central region.

**Figure 1 – LPV Coverage, Week 1330 Day 0, 7/3/2005**



Two Ionspheric Grid Points (IGP) being set to ionospheric storm state caused the loss of availability in this area. The IGP's, located at 100W 30N and 100W 25N, had their GIVE values changed to 45 meters (GIVEI = 14, storm state) by a Type 26 messaged issued at 2412 seconds GPS time of week from both WAAS GEO's. Both IGP's were in storm state for 871 seconds as shown in table 1. An IGP transitions to storm state if the GIVE irregularity detector fails on both the A and B threads.

**Table 1 – WAAS AORW IGP Data Broadcast**

| Band | IGP | Latitude | Longitude | Previous Givei | Current Givei | Previous Time | Current Time | Delta Time |
|---|---|---|---|---|---|---|---|---|
| B2 | I421 | 25 | -100 | 11 | 14 | 0 | 2412 | 2412 |
| B2 | I422 | 30 | -100 | 11 | 14 | 0 | 2412 | 2412 |
| B2 | I421 | 25 | -100 | 14 | 11 | 2412 | 3283 | 871 |
| B2 | I422 | 30 | -100 | 14 | 11 | 2412 | 3283 | 871 |

Low geomagnetic activity was observed this day, as shown in Figure 2, with the KP index reaching a maximum of 4 during the day. Typically a KP index of 5 or higher will trigger storm state for an IGP.

**Figure 2 – Kp Index, May 3rd 2005 (Week 1330 Day 0)**

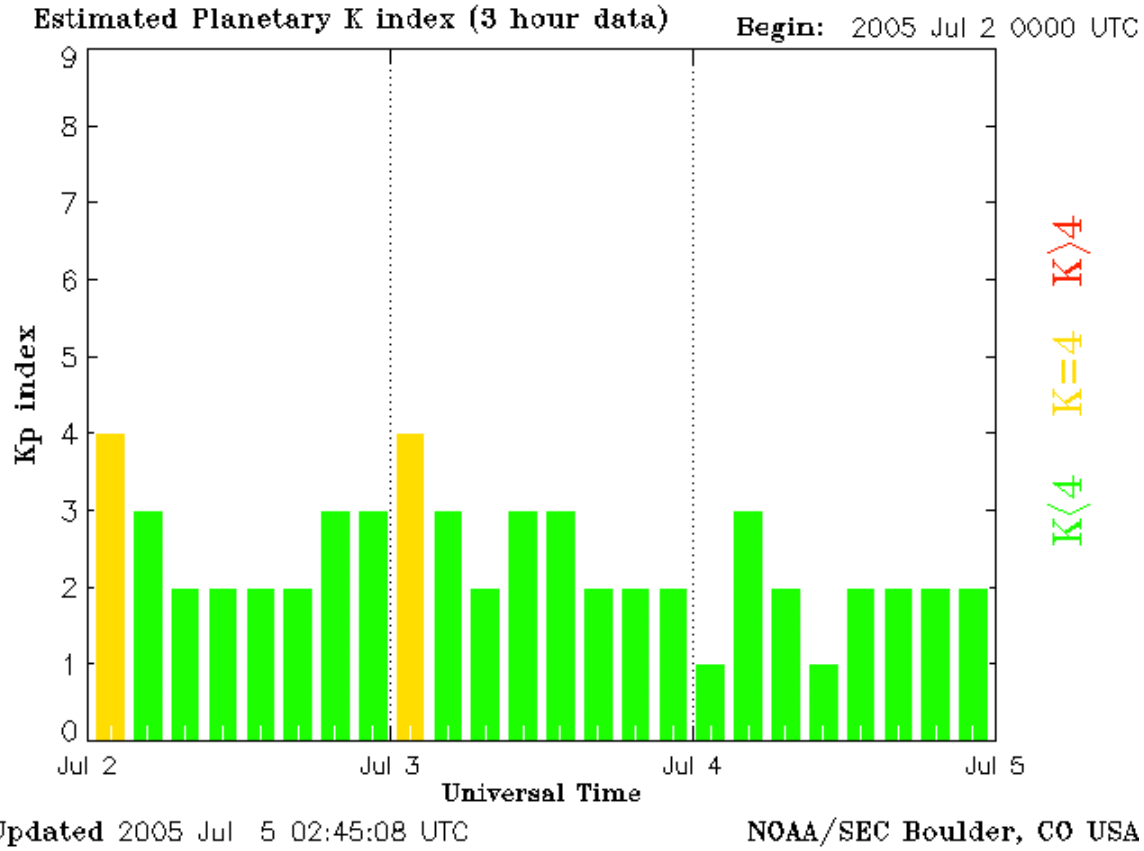


Figure 3 shows the ionospheric vertical delay verses time for both IGP's set to ionospheric storm state. The vertical delays due to the ionosphere changed only 0.13 meters during the time of the event. Vertical delays plotted in red indicate that ionospheric storm state is activated. Based on the WAAS estimate of the ionospheric delay there was no appreciable change in the delay to trigger a storm state in the subject IGP's. Figure 4 shows several satellites dual frequency slant ionospheric delays from Houston WRS during the time that the IGP's were in storm state. The ionospheric delays for all the satellites change slowly with time, indicating that the ionosphere in the region was normal during the time of the event.

**Figure 3 – WAAS IGP Vertical Delay verses Time**

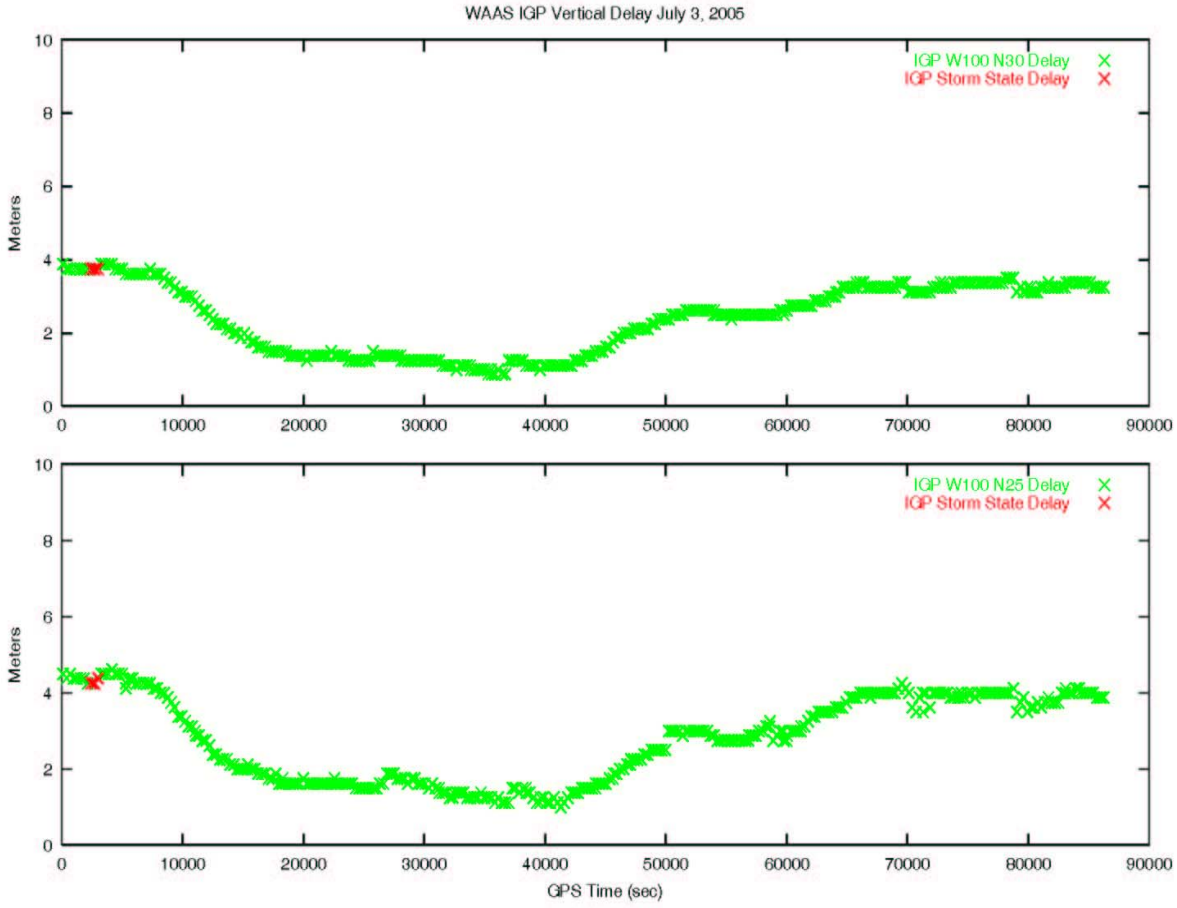
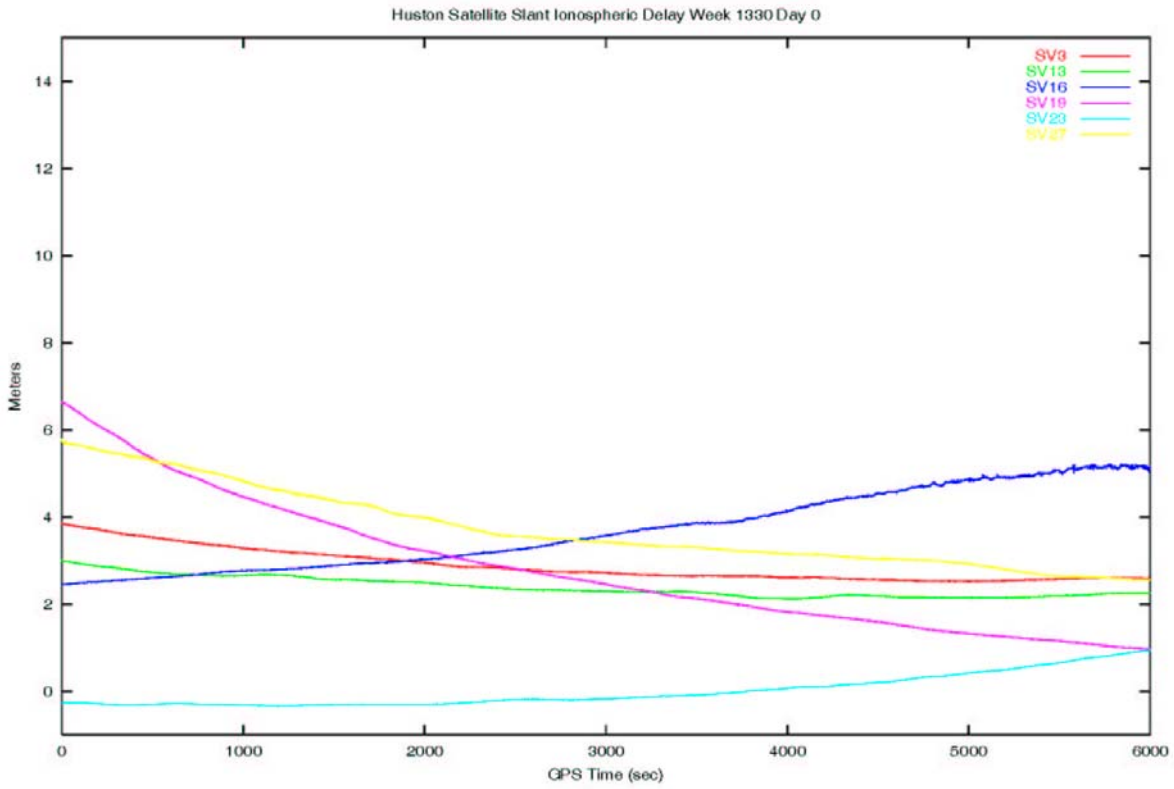


**Figure 4 Satellite Dual Frequency Slant Ionospheric Delays**




## Conclusion:

The Loss of LPV service in the south central region of CONUS on July 3, 2005 was due to Ionspheric Grid Points (IGP), located at 100W 30N and 100W 25N, being set to ionospheric storm state. During the time that in which the subject IGP's were in storm state, there was no observed ionoshperic activity which should cause WAAS IGP's to trigger.