Appendix E

Clark County, Nevada

Section 1: Refined PM_{10} Aeolian Emission Factors for Native Desert and Disturbed Vacant Land Areas - Final Report - June 30, 2006

Section 2: Addendum to 2004 Wind Tunnel Study – PM_{10} Milestone Achievement Report – Final Report – June 30, 2006

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Section 1: Refined PM_{10} Aeolian Emission Factors for Native Desert and Disturbed Vacant Land Areas

Final Report

June 30, 2006

Refined PM_{10} Aeolian Emission Factors for Native Desert and Disturbed Vacant Land Areas

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Final Report – June 30, 2006

*Revision of July 8, 2005 draft report in response to changes requested by Clark County
Department of Air Quality and Environmental Management*

Executive Summary

The purpose of this report is to document the development of improved emissions factors for the PM-10 fraction of wind-blown dust emitted from vacant lands in metropolitan portions of Clark County, Nevada. The Clark County Department of Air Quality and Environmental Management (DAQEM) contracted with the Department of Civil and Environmental Engineering, University of Nevada, Las Vegas (UNLV) to conduct field studies to generate refined wind-blown PM-10 emissions factors (EF's). The refined EF's will be utilized for future updates of the Clark County emissions inventories. The PM-10 State Implementation Plan (SIP) contains a commitment to refine the emissions factors for native desert and disturbed open land areas by 2005.

Field work for this project was conducted at 32 field sites located in nine Wind Erodibility Groups (WEG) in Clark County in the summer of 2004. Each site was first characterized for its stability, then measured by a portable wind tunnel, first on the native surface, and then measured again on a freshly-raked surface, created to represent a "worst-case" scenario for unstable surfaces. Thirty-one of the 32 sites were rated as "stable" in their native condition.

Stable PM-10 emissions factors (EF's) generally trended from 0.001 ton/acre/hour for low wind speed bands to 0.020 ton/acre/hour for high wind speed bands. Stable EF's for WEG 3 and 4L did not exceed 0.01 ton/acre/hour in any wind speed band. Unstable PM-10 EF's tended to be higher than stable EF's in each Wind Erodibility Group. Wind Erodibility Group 6, (about 0.10 ton/acre/hour) exhibited higher unstable EF's than the other Wind Erodibility Groups.

Measured geometric mean stable PM-10 emissions factors (fluxes) averaged over all Wind Erodibility Groups varied from 0.0016 ton/acre/hr at low (15-20 mph) wind speed bands to 0.013 ton/acre/hour at high (45-50mph) wind speed bands (Figure ES-1, Table 34). Averaged over all Wind Erodibility Groups, geometric mean unstable PM-10 emissions factors (fluxes) varied from 0.0013 ton/acre/hr at low (15-20 mph) speeds to 0.031 ton/acre/hour in the high (45-50 mph) wind speed bands (Figure ES-1, Table 34).

Generally speaking, unstable emissions factors were similar in magnitude to stable emissions factors in the 10-15 mph and 15-20 mph wind bands. Unstable EF's were 1.5 times larger in the 20-25 mph wind band. At wind speeds above 25 mph, unstable emissions factors were, when averaged together, a factor of 2.4 higher than stable emissions factors.

The 2004 UNLV stable EF's values are similar values reported by Nickling and Gillies (1989) for total suspended particulates emitted from undisturbed surfaces. UNLV 2004 unstable EF's are a factor of 2.4 higher than values reported by Nickling and Gillies. UNLV stable PM-10 flux data are a factor of 8 higher than values reported by Gillette and Passi (1988), a factor of 80 higher Shao et al (1993), and a factor of 4.4 higher than values reported by Stetler and Saxton (1996) for fugitive dust emitted from the Columbia plateau.

Averaged over all Wind Erodibility Groups, the 2004 UNLV PM-10 stable emissions factors are 82% of the 1995 stable PM-10 EF's in the 15-20 mph wind band, 220% of the 1995 stable EF in the 20-25 mph wind band, and 400% of the 1995 stable EF in the 25-30 mph wind band. However, because 1995 EF data were derived from small sample sizes, the 15-20 mph and 20-25 mph ratios should be considered to be unreliable. For reliable data, geometric mean 2004 stable erosion rates were, on average, a factor of 3.14 higher than 1995 unstable erosion of rates, with multipliers ranging from 01.89 to 4.03.. When considered by themselves, all 2004 PM-10 stable EF's have sufficiently large sample sizes to be considered to be reliable for all wind bands except for 45-50 mph.

Averaged over all Wind Erodibility Groups, the 2004 UNLV PM-10 unstable emissions factors are 26% of the 1995 unstable PM-10 EF in the 15-20 mph wind band, 89% of the 1995 unstable EF in the 20-25 mph wind band, and 344% of the 1995 unstable EF in the 25-30 mph wind band. Again, because 1995 EF data were derived from small sample sizes, the 15-20 mph and 20-25 mph ratios should be considered to be unreliable. Reliable unstable 2004 erosion rates were on average 3.86x higher than 1995 erosion rates in the 25-40 mph wind bands, with ratios ranging from 3.44 to 4.00. When considered by themselves, all 2004 PM-10 unstable EF's have sufficiently large sample sizes to be considered to be reliable for all wind bands except for 45-50 mph.

Larger data sets were obtained in the 2004 study, because the wind tunnel was operated in three locations at each study site, and, at each location, measured emission from both stable and unstable soil. At each location, the tunnel was operated at four or five wind speeds, producing 12 to 15 data points for each soil stability condition at each site. During the 1995 study, the tunnel was used on one location at each site. The soil was tested in the as-found condition (stable or unstable). At each 1995 site, the tunnel was operated at three or four wind speeds, yielding three to four data points for only one stability condition at each site.

The higher 2004 stable EF's likely occurred because of differences in sampling methods. The 2004 field study employed shorter periods (4.0 minute) of steady-state erosion at each velocity compared to the 1995 study (10 minutes), so that the average erosion rate was calculated on a surface that had not been depleted of erodible particles for as long a period as during the 1995 study.

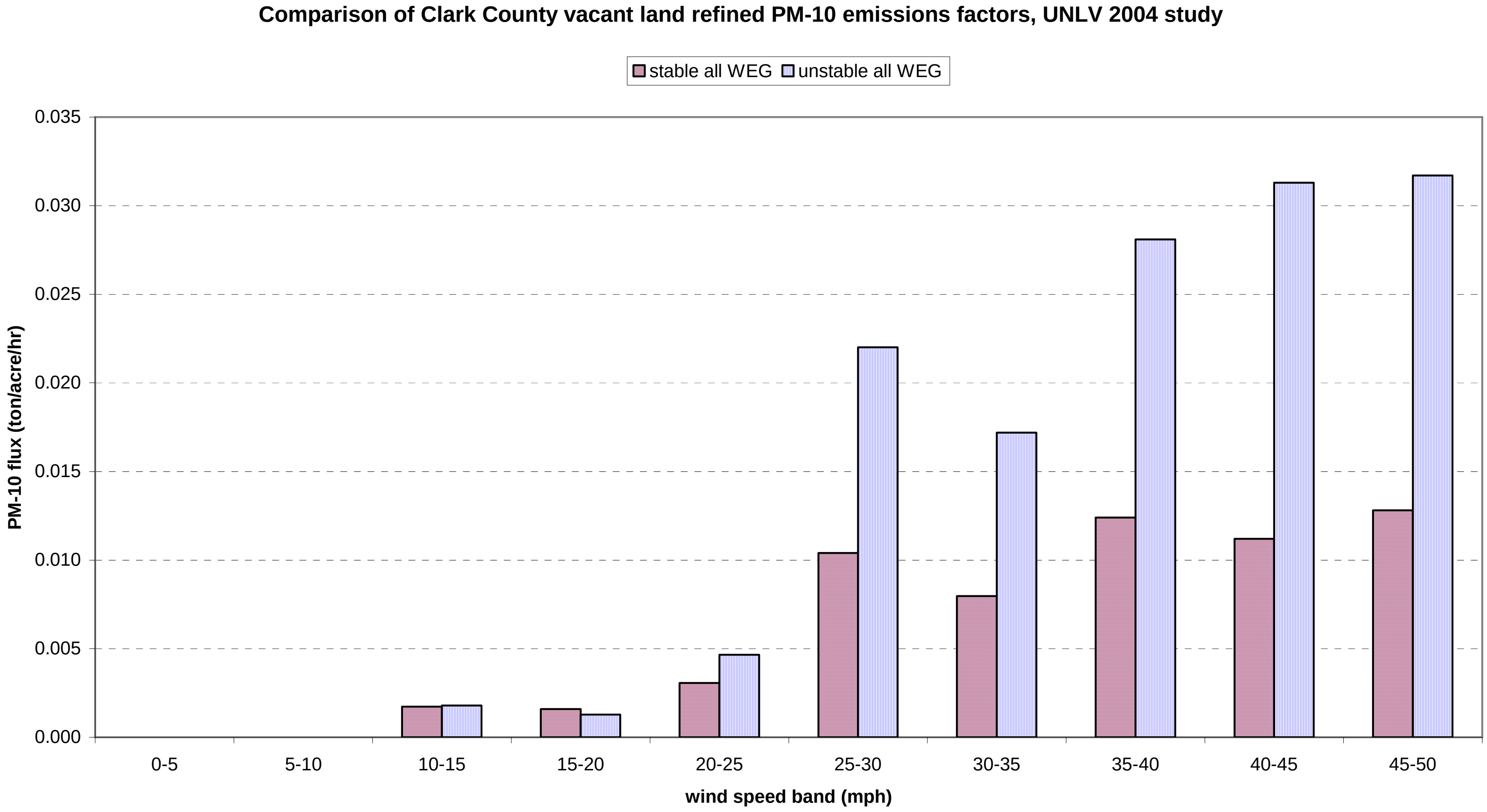
Higher 2004 unstable EF's likely occurred because unstable surfaces were intentionally created by disrupting soil crust with a metal garden rake. In the 1995 field study, unstable surfaces were measured "as found" without additional mechanical destabilization. The 2004 unstable PM-10 emission factor data represent a worst-case scenario of wind-borne PM-10 emissions from a freshly disturbed surface that had not been treated with dust palliatives.

In 2004, the average ratio of Unstable/Stable erosion rate was 1.12 in the 10-25 mph wind bands, and 2.36 in the 25-50 mph wind bands. Figure ES-1 shows that stable and unstable PM-10 EF's are similar in magnitude in the 10-15 and 15-20 mph wind bands. Unstable PM-10 EF's start increase relative to stable EF's in the 20-25 mph and 25-30 mph wind bands. Unstable PM-10 EF’s hit a plateau at about 2.3x stable PM-10 EF’s in the 35-40, 40-45 and 45-50 mph wind bands.

A change in wind tunnel field measurement technique resulted in measurable PM-10 emissions rates for all wind speeds down to the minimum velocities observed in the wind tunnel with the damper wide open. The minimum velocities were 10.3 mph for stable surfaces and 11.4 mph for unstable surfaces. Because of this change in technique, threshold velocities for initiation of PM-10 erosion are not available from the 2004 field study.

However, scatter plots of both stable and unstable PM-10 flux data against 10-meter velocity indicate significant non-linear increases in measured PM-10 emissions factors at wind speeds above 25 mph. When considering geometric means in each wind band, PM-10 Emissions Factors for velocities above the 20-25 mph wind band are about one order of magnitude higher than PM-10 Emissions Factors for velocities below the 20-25 mph wind band. The 20-25 mph wind band represents a transitional zone between the “low” and “high” PM-10 emissions wind bands. The order-of-magnitude shift in PM-10 emissions that occurs from 15-20 mph to 25-30 mph leads us to conclude that 25 mph could serve as a threshold value for a Natural Events Action plan.

Figure ES-1 – Summary of wind-blown geometric mean PM-10 Emissions factors, averaged over all wind erodibility groups. UNLV 2004 wind tunnel field study. Error bars omitted to clarify differences between wind speed bands.



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Introduction

Four tasks were described in the scope of work for this project:

1) Preplanning.

2) Conduct Field Reconnaissance and site characterization at selected field sites.

3) Field wind tunnel measurements. Develop PM-10 emission factors at the selected sites through wind tunnel measurements.

4) Data work up and transmit technical report to DAQEM.

1 - Preplanning, field reconnaissance, and site characterization

1.1 Preplanning

The Refined Emission Factors Project started on June 1 of 2004, by selecting initial list of sites to be tested in consultation with Clark County Department of Air Quality and Environmental Management (DAQEM) to correspond with US NRCS major wind erodibility group (WEG). The sites checked included the following WEGs: unclassified (designated as UN or 0), 2, 3, 4, 4L (sometimes designated as 4.1), 5, 6, and 7, which were physically available in the Las Vegas Valley. Concomitant with site selection, the project team was staffed, and wind tunnel parts and instruments were prepared for field work. Supplies were ordered and calibrations of instruments were done.

1.2 Field reconnaissance and site characterization

Field reconnaissance was initiated on June 16, 2004. Initial site planning was carried out by review of available soil maps, street maps and aerial photos. Fifty-three (53) sites were selected for visitation and possible characterization. Of the 53 sites visited, 17 locations were not accessible or were determined to be not suitable for wind tunnel experiments. The thirty-six (36) remaining sites were selected for characterization.

Sites were selected in approximate proportion to the area of land covered by each major wind erodibility group within the Bureau of Land Management (BLM) land disposal boundary (Table 1). The approximate distribution of sites across the Valley is shown relative to major cross streets in Figure 1.

Figure 1 – Approximate major streets locations of 2004 Wind Tunnel test sites Las Vegas Valley, Clark County, Nevada

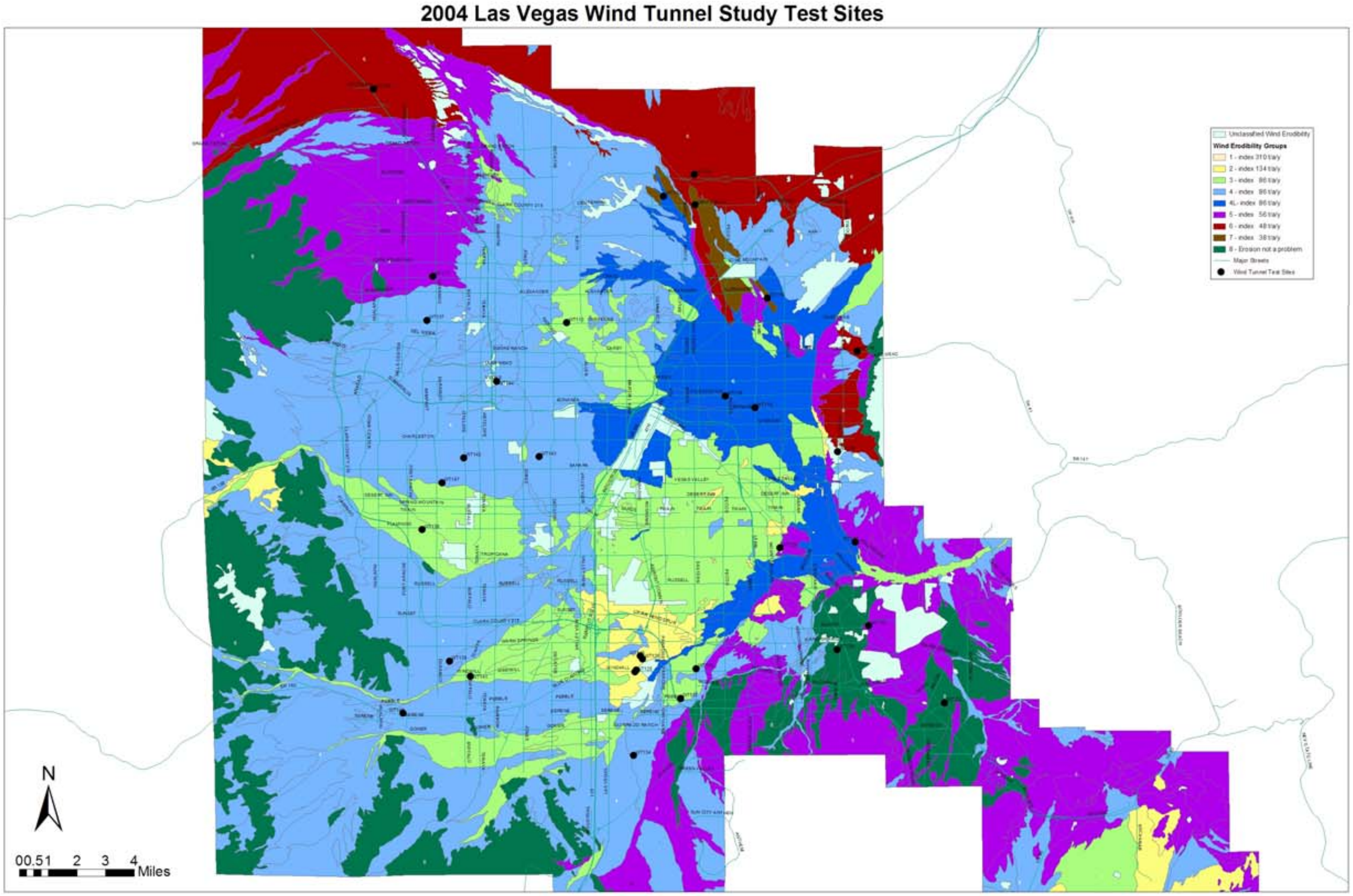


Table 1 – Summary of site aerial coverage

WEG	COUNT	TOTAL AREA (ft^2)	TOTAL AREA (square miles)	NUMBER OF SITES	SQUARE MILE PER SITE	SITES PER SQUARE MILE
Unclassified	0	796,869,944	28.58	1	28.58	3.50E-02
2	25	526,255,269	18.88	4	4.72	2.12E-01
3	63	2,474,638,279	88.77	6	14.79	6.76E-02
4	180	7,416,845,250	266.04	8	33.26	3.01E-02
4L	18	1,194,982,715	42.86	3	14.29	7.00E-02
5	162	3,502,786,243	125.65	3	41.88	2.39E-02
6	15	1,817,786,973	65.20	3	21.73	4.60E-02
7	6	98,860,921	3.55	2	1.77	5.64E-01
8	61	2,983,670,293	107.02	2	53.51	1.87E-02

From June 21 to June 30, 2004, the project team visited all 36 sites and performed initial site characterization, consisting of ball drops at three locations (5 drops per location), three non-erodible element counts on 100-foot transects, and three field sieve tests. A set of four landmark digital photographs (north, south, east west) was taken and Global Positioning coordinates were measured using a hand-held, uncorrected Garmin eTrex® hand held GPS unit, accurate to15 meters RMS for position accuracy. To determine major soil group, site GPS coordinates were sent to UNLV Transportation Research Center (TRC) for site mapping using ESRI ArcInfo© software and a database of WEG boundaries. From the 36 sites characterized, 32 sites were sampled by the wind tunnel field crew.

Table 2a shows the list of sites characterized and tested with the Wind Tunnel.

Three digit numeric site codes were assigned to each tested location. Site numbering is sequential from the first UNLV wind tunnel study conducted in Clark County in 1995. Site numbering commenced, for 2004, with site number WT 111. Some of the 2004 sites were tested in the same locations as sites tested during 2003. However, as the sites were ultimately tested with a different wind tunnel technique, and had been subjected to an additional year of erosion and traffic, they were given a unique site number.

Table 2a – Wind tunnel field study site locations

SITE NUMBER	CROSS STREET	CORNER	TEST WEG	WT RUN	W LONGITUDE COORD	N LATITUDE COORD
WT111	Craig and Durango	NW	5	7/14/2004	115.2800	36.2413
WT113	Cheyenne and North Valley Drive	NE	3	7/21/2004	115.1966	36.2178
WT115	1 mile E Lamb & LV Boulevard	SE	7	7/22/2004	115.0719	36.2298
WT116	E Carey & N. Hollywood	0.6 mi on Carey	6	7/28/2004	115.0160	36.2028
WT118	Bonanza & Lamb	NE	4L	7/27/2004	115.0797	36.1747
WT119	Washington & Pecos	SE	4L	8/2/2004	115.0980	36.1805
WT121	W Vegas Valley & S Hollywood	2 miles on HW	5	8/3/2004	115.0179	36.1069
WT122	Palo Verde & Salsalito	NE	8	7/13/2004	114.9631	36.0257
WT123	Sunset & Boulder	SE	5	7/30/2004	115.0097	36.0647
WT124	Gibson & Kelso Dunes	NW	8	8/4/2004	115.0294	36.0529
WT125	Tropicana & Sun Valley	NW	3	8/23/2004	115.0646	36.1042
WT126	Warm Springs & Amigo	SW	2	7/19/2004	115.1504	36.0486
WT127	Windmill & Bermuda	NE	2	7/15/2004	115.1543	36.0430
WT128	Windmill & Bermuda RE-DO w/ new Procedure	SW	2	8/20/2004	115.1552	36.0421
WT130	Windmill & Eastern	NE	3	8/5/2004	115.1171	36.0436
WT131	Pebble & Spencer	NE	3	7/20/2004	115.1269	36.0287
WT132	N Fifth Street & E Centennial Pk	NE	4L	8/6/2004	115.1360	36.2812
WT133	Centennial & Losee	NE	7	7/26/2004	115.1164	36.2768
WT134	Cactus and Bermuda	NW	4	7/12/2004	115.1561	36.0001
WT135	215 & Losee	NW	6	7/23/2004	115.1171	36.2920
WT136	American Beauty & Hollywood	SW	UN	7/29/2004	115.0284	36.1524
WT137	Cheyenne between El Capitan and Rampart	N	4	8/10/2004	115.2835	36.2193
WT138	Flamingo & El Capitan	SE	3	8/11/2004	115.2871	36.1141
WT139	W Robindale & Cimarron Rd	S of Robindale	4	8/12/2004	115.2701	36.0479
WT140	Blue Diamond & Srigo	N	4	8/13/2004	115.2992	36.0217
WT141	Windmill near Rainbow		3	8/18/2004	115.2572	36.0403
WT142	Oakey & Buffalo	SE	4	7/16/2004	115.2610	36.1501
WT143	Oakey & Mohawk	SE	4	8/16/2004	115.2142	36.1506
WT144	Vegas & Rainbow	NE	4	8/9/2004	115.2405	36.1885
WT146	Frontage Road at end of Road	E	6	8/17/2004	115.3167	36.3356
WT147	Edna & Van Allen	NW	4	8/24/2004	115.2746	36.1376
WT148	Batista & Robindale	NE	2	8/25/2004	115.1517	36.0501

Table 2b shows the six characterized sites that were not tested with reasons for why they were not tested with the wind tunnel.

Table 2b – Wind tunnel field study site locations not used

SITE NUMBER	CROSS STREET	CORNER	TEST WEG	REASON WHY WAS NOT USED FOR WT RUN
112	Alexander & Durango	NE	4	Construction was taking place when site was visited for WT Runs
114	Carey & Simmons	NW	3	Had enough number of site WEG 3
117	Desert Inn & Nellis	SW	3	Construction was taking place when site was visited for WT Runs
120	Charleston & Nellis	SW	3	Very Disturbed site
129	Windmill & LV BLV	NW	2	Had enough number of site WEG 2
145	Anne & Hualapai	NE	5	Owner did not allow site to be used

1.3 Methods for determination of site stability

In 2004, site stability was determined by presence or absence of intact crust, by proportion of vegetation present (using an average from three 100-foot transects, counting vegetation every foot), and by evidence of human disturbance (tire tracks, trash, litter, evidence of recent earthmoving). Additionally, three surface soil samples were collected and subjected to a field sieve analysis to estimate threshold friction velocity. The following decision tree procedure was used to characterize the sites.

1.3.1 Site stability characterization decision tree (flow chart)

This procedure classifies the soil surface using the numerical criteria and flow scheme from Clark County Department of Air Quality and Environmental Management Air Quality Regulations, Section 90 – Fugitive Dust from Open Areas and Vacant lots, Subsection 90.4. Test Methods, revised 12/17/2002.

1. A one foot sampling wire square was randomly cast five times at each site;
2. Ball drop was performed (a 3/8 inches diameter stainless steel ball was dropped from a height of one foot) five times within each randomly cast sampling square. If a majority of the drops produced no visible crack or dent in the surface, it was considered stable. If a majority of the drops produced a crack or dent it was considered unstable. If the majority of the results was stable, the site was considered stable;
3. Flat “vegetative” surface cover was measured next (“vegetative” = all sheltering elements on ground was greater than 1 cm diameter) using 100-foot transects (string count). Three transects were established using a random number generator. Each random number was multiplied by 360 degrees to generate the compass angle used for the transect. A string with 1 cm orange beads attached at 0.50 foot intervals was laid out along the transect. A field technician walked along the string, counting sheltering objects that were observed under every other bead, i.e. at 1.00 foot intervals. Any object directly under one edge of a bead that was larger than the 1cm bead was counted as a plus (+), and considered a sheltering element. Anything less than the bead size was counted as a minus (-), and not considered a

sheltering element. Total pluses and minuses were tallied for each 100 foot transect. If the average number of pluses was greater than 50, then that transect site was considered stable;

4. Percent rock cover (also called the "cake pan test") was next performed in three random casts of the wire square. This improved technique replaces the mental rock grouping procedure found in Section 41.7.2.2 (c) through (f). The top layer of rocks and debris was scraped off the surface to a depth of 1 centimeter and poured through a 3/8" diameter sieve. Elements retained on the 3/8" sieve were placed in a metal cake pan, squared with a straight edge, and then measured with a ruler. The covered area was calculated. If average cover of elements larger than 1 cm value occupied a cake pan area larger than 10% of the site surface area, then the site was considered stable. The test was repeated for two more samples;
5. A threshold friction velocity (TFV) test was next performed done using soil sieves. The sieve stack consisted of 4 mm, 2 mm, 1 mm, 0.50 mm, and 0.25 mm. A soil sample was poured into the top sieve, the stack was covered, and 10 rapid circular swirls were applied in the clockwise direction, followed by 10 counterclockwise swirls. The stack was disassembled and the volume retained in a graduate cylinder. A threshold friction velocity for initiation of soil movement was assigned based on the size fraction with the largest retained volume. If average uncorrected TFV was greater than 100 cm/sec, then site was considered stable;
6. If the uncorrected TFV was less than 100 cm/sec, then we calculated a corrected TFV using data from the cake pan test and a look up table that assigns TFV correction factors for different levels of rock cover. The corrected TFV is calculated as Corrected TFV = (correction factor) x Uncorrected TFV. If the average corrected TFV was greater than 100 cm/sec, then site was considered stable.
7. Characterization of the subsurface soils was not performed.

1.3.2 Site stability – impact on wind tunnel test methodology

Most sites visited in 2004 were either crusted or covered with sufficient non-erodible elements (rock, gravel, vegetation, other debris) to be classified as initially "stable." Of 32 sites characterized and tested with the wind tunnel, 31 were rated as stable (Table 3). As a result, all wind tunnel measurements were first conducted on the undisturbed, stable surface at each site. The wind tunnel was removed and the surface was intentionally destabilized to a depth of two inches (5.0 centimeters) by the wind tunnel field crew using an 18-inch (45 centimeter) wide metal garden rake with tines on one-inch (2.54 cm) centers. Approximately five passes were made by the rake over the ground surface to break up the ground surface crust and expose the underlying soil. Application of the rake may have broken up some existing soil aggregates, but this was not measured. The wind tunnel was replaced on the now unstable surface, and the erosion measurements were repeated. The same method was used on all sites.

UNLV believes that the garden rake method of rendering surfaces unstable is a “worst-case” scenario for an unstable desert soil surface, and might be analogous to wind erosion on a recently-graded soil surface at a construction site before any dust control measures have been applied. UNLV is aware that Clark County’s current construction Best Management Practices require that any such surfaces that are created during construction need to be stabilized by any one of several approved methods.

Many desert soils in the Las Vegas Valley, given either intentional watering or rainfall to a depth of 0.10-0.20 inches, will form crusts that will reduce subsequent wind erosion.

As a result, the UNLV unstable wind tunnel test results should be viewed as representative of a worst-case potential to emit PM-10 from surfaces that have not yet been subjected to mandated dust control practices. Actual wind-borne emissions from operating and fallow unstable surfaces will very likely be lower than UNLV’s reported values for land surfaces rendered unstable by the garden-rake method.

1.3.3 Site stability – results

Table 3 presents all WT 2004 sites location with dates when the sites were characterized and wind tunnel runs. This table also summarizes the stability tests results from field site visits, including visual assessment, ball drop, vegetation and rock count, Cake Pan test, Threshold Friction Velocity determination using sieve analysis, and the final stability decision.

Table 3a – Stability test results

Site	Cross Streets	Initial Subjective Stability Field Obs.	Date of Charact.	Date Wind Tunnel Tested	First stability test, Ball Drop Result (If # Pass > # Fail, then Stable)	Second stability test, nonerodable (Veg+Rock) percent cover. If > 50%, then Stable	Third stability test Cake Pan Result	Stability Final Decision Using Average Corrected TFV
WT111	Durango & Craig	S	6/21/2004	7/14/2004	U	U	U	S
WT113	Valley Drive & Cheyenne	S	6/21/2004	7/21/2004	U	U	U	U
WT115	Lamb & LV Bloulevard	S	6/21/2004	7/22/2004	S	U	U	S
WT116	Hollywood and Carey	S	6/22/2004	7/28/2004	S	S	U	S
WT118	Bonanza & Lamb	U	6/22/2004	7/27/2004	U	U	U	S
WT119	Washington & Pecos	S	6/22/2004	8/2/2004	S	U	U	S
WT121	Vegas Valley & Hollywood	S	6/23/2004	8/3/2004	S	S	S	S
WT122	Palo Verde & Salsalito	S	6/23/2004	7/13/2004	S	U	S	S
WT123	Sunset & Boulder	S	6/23/2004	7/30/2004	S	U	U	S
WT124	Kelso Dunes & Gibson	S	6/23/2004	8/4/2004	S	U	U	S

Table 3a – Stability test results (continued)

Site	Cross Streets	Initial Subjective Stability Field Obs.	Date of Charact.	Date Wind Tunnel Tested	First stability test, Ball Drop Result (If # Pass > # Fail, then Stable)	Second stability test, nonerodable (Veg+Rock) percent cover. If > 50%, then Stable	Third stability test Cake Pan Result	Stability Final Decision Using Average Corrected TFV
WT125	Sun Valley & Tropicana	S	6/24/2004	8/23/2004	S	U	U	S
WT126	Warm Springs & Amigo	S	6/24/2004	7/19/2004	U	U	U	S
WT127	Windmill & Bermuda	S	6/24/2004	7/19/2004	U	U	S	S
WT128	Windmill & Bermuda	S	6/24/2004	7/9/2004	S	U	S	S
WT130	Windmill & Eastern	U	6/24/2004	8/5/2004	U	U	S	S
WT131	Pebble & Spencer	S	6/24/2004	7/20/2004	S	U	U	S
WT132	Centennial & N. 5th Street	S	6/25/2004	8/6/2004	S	S	S	S
WT133	Losee & Centennial	S	6/25/2004	7/26/2004	S	S	S	S
WT134	Cactus & Bermuda	S	6/25/2004	7/12/2004	S	S	S	S
WT135	215 & Losee	S	6/28/2004	7/22/2004	S	S	S	S
WT136	American Beauty & Hollywood	S	6/28/2004	7/29/2004	S	U	S	S
WT137	Chyenne between El Cap/Rampart	S	6/28/2004	8/10/2004	S	U	S	S
WT138	Flamingo & El Capitan	S	6/29/2004	8/11/2004	S	S	S	S
WT139	W Robindale & Cimararon	S	6/29/2004	8/12/2004	U	S	S	S
WT140	Srigo & Blue Diamond	S	6/29/2004	8/13/2004	S	S	S	S
WT141	Windmill & near Rainbow	S	6/29/2004	8/18/2004	S	U	U	S
WT142	Buffalo & El Parque	S	6/29/2004	7/16/2004	S	S	S	S
WT143	Oakey & Mohawk	S	6/29/2004	8/16/2004	U	U	U	S

Table 3a – Stability test results (continued)

Site	Cross Streets	Initial Subjective Stability Field Obs.	Date of Charact.	Date Wind Tunnel Tested	First stability test, Ball Drop Result (If # Pass > # Fail, then Stable)	Second stability test, nonerodable (Veg+Rock) percent cover. If > 50%, then Stable	Third stability test Cake Pan Result	Stability Final Decision Using Average Corrected TFV
WT144	Rainbow & Vegas	S	6/30/2004	8/9/2004	S	S	S	S
WT146	Frontage Road at end	S	6/30/2004	8/17/2004	S	S	S	S
WT147	Edna & Van Allen	S	8/24/2004	8/24/2004	S	S	S	S
WT148	Bartista & Robindale	S	8/25/2004	8/25/2004	S	S	S	S

1.3.4 Soil moisture test methods

Typically, about 1/4 cubic foot of hard-packed soil was excavated to a depth of six inches and formed into a loose mound. A Dynamax™ model HH2 soil moisture meter was used to measure soil moisture content. The Dynamax™ probe was inserted into the mound, which was compressed around the probe's three antennae by hand. This "hand-packing" method was developed because the *in-situ* level of compaction for desert soils was so great that the HH2 probe could not be forced into the packed, crusted *in-situ* soil without risk of damage to the Dynamax probe's antennae.

The meter then was activated to read the volumetric soil moisture content. This process was repeated three times at each wind tunnel test site, in a triangle pattern around the site being prepared for a wind tunnel, with each soil measurement site located between 15 and 30 meters from the wind tunnel site. Since soils near the wind tunnel site had been freshly excavated for the moisture measurements, it was assumed that the measured soil moistures were similar to soil moistures that were present at the wind tunnel site.

1.3.5 Soil moisture results and likely impacts on wind erodibility.

Soil moisture contents ranged from [one to five] volume percent, as measured by the Dynamax HH-2 soil moisture meter, with a mean volumetric moisture content of [2.2%]. When divided by bulk soil density (typically 1.6 gram/cm^3), estimated gravimetric soil moisture contents ranged from 0.7 to 3.0 mass percent, with a mean estimated gravimetric moisture content of 1.4% . US National Weather Service forecasts and rain gauges from the Clark County Regional Flood Control District's Flood Threat Recognition System (FTRS) were consulted to schedule wind tunnel field test locations in portions of the valley that had not received rainfall for at least 72 hours. A research project completed by graduate student Kamakshi Krishna Sistla on effects of soil moisture on PM-10 emissions indicated that, on a hot dry summer day, PM-10 emissions from soils in the highest Particulate Emission Potential group (similar to Wind Erodibility Groups 2 or 3) significantly increased after one hour drying time.

Gravimetric soil moisture procedures require 16 hours of drying time in a 105°C oven to obtain a constant weight. Although the in-situ time to dry after a storm is not known, field observations show that dust plumes are usually emitted from recently wetted well-drained soils in one to two days after a rain event.

Additionally, a gravimetric moisture content of at least 2.5% (approximately corresponding to a 4.0 volumetric percent moisture content) is specified in Clark County's Best Management Practices as a minimum threshold for suppression of dust during crushing, conveying and storage operations. All wind tunnel test site soil moisture measurements were well below the 4.0 volumetric percent volumetric moisture content threshold. Although the evidence is circumstantial, UNLV predicts that field soil moisture conditions were sufficiently low as to not significantly reduce *in-situ* PM-10 emissions as recorded by the portable wind tunnel.

1.4 Site stability - data organization

The site characterization information for each site is organized in a FilemakerPro™ software file. This file summarizes technical information about each site tested, such as: WEG, location of the site (GPS coordinates and cross streets), dates of characterization and WT runs, field observations, soil moisture content, ball drop result, total vegetative count, average cake pan percent cover, average corrected TFV, stability characterization, as well as landmark pictures. This database, in electronic file format, will be transmitted to DAQEM.

2 - Portable wind tunnel – description of equipment and experimental procedures

2.1 Description of wind tunnel

The UNLV-wind tunnel used in the 2004 field study is a modification of the draw-through design developed, in the early 1990's, by Duane Ono at Great Basin Unified Air Pollution Control District, Bishop, California and Dr Chatten Cowherd at Midwest Research Institute, Kansas City, Missouri. Modifications to the UNLV tunnel include a 6 inch diameter working section instead of 4 inch section, and addition of a TSI Dust-Trak® PM-10 monitor in the riser section. Instead of a sharp metal runners, three-inch wide heavy gauge plastic flaps, open cell foam and 2-inch diameter 6-foot long cloth draft tubes filled with coarse sand were used to seal the tunnel to the soil surface. A rear air bypass and constant speed motor were used to control averaging flow instead of a venturi and an electronic motor speed controller. Major components of the tunnel are shown schematically in Figure 2. Wind tunnel processes are diagrammed in Figure 3.

The working section of the tunnel is 6.00 inches wide x 6.00 inches high x 60 inches long. Additionally, not shown in the figure, there is a 60-inch long flow-conditioning section installed ahead of the working section of tunnel with a honeycomb flow diffuser at the front end, giving the incoming air 10 tunnel diameters to develop a turbulent profile before it passes into the tunnel working section.

A Dwyer Model 160-12 90-degree pitot tube (labeled "profiling pitot tube" in Figure 2) is located in the working section, attached to a height adjusting system that allows the tube to be set at a logarithmic series of elevations above the soil surface. The pitot tube is connected in parallel to a TSI DP-Calc™ digital micromanometer, reading from -5 to +15 inches of water, to allow measurement of pressure drop over the range of expected flow conditions.

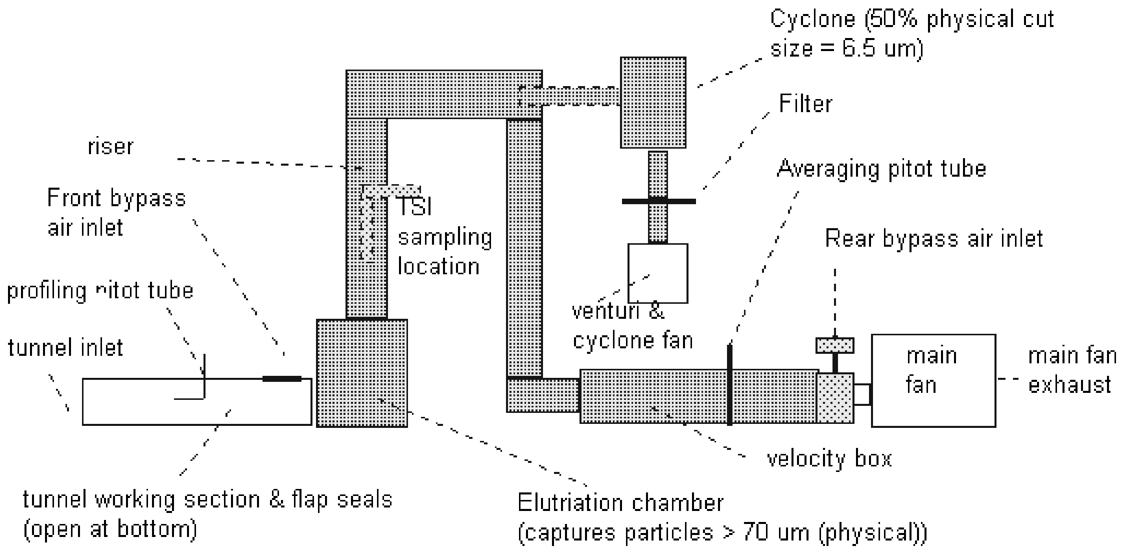
As air passes through the working section of the tunnel, it entrains particulates from the soil surface (Figure 3), and the particulates are conveyed in the air flow through the working section to the divergence section. The divergence section contains a front bypass air inlet, located on the top of the section. The size of the front bypass opening is controlled by a sliding damper (Figure 3). The purpose of this front bypass air inlet is to control the volumetric flow rate of air in the working section, and thus control the erosion velocity. Air flow rate in the working section is lowest when the damper is wide open and highest when the damper is closed. In field work, the damper is adjusted to give a specified centerline pitot tube reading for a particular erosion run.

The divergence section is connected to a rectangular metallic box called the elutriation chamber (Figure 2). As air flow enters the elutriation chamber and slows down, the chamber captures particles with diameters greater than 70 microns physical diameter (Figure 3). A door at the back of the elutriation chamber allows it to be cleaned after each wind tunnel run.

Air flow leaves the elutriation chamber through a 6-inch inside diameter PVC pipe section, called the riser (Figure 2). Air velocity in the riser is generally sufficient to suspend soil particles with physical diameters less than 70 microns (Figure 3).

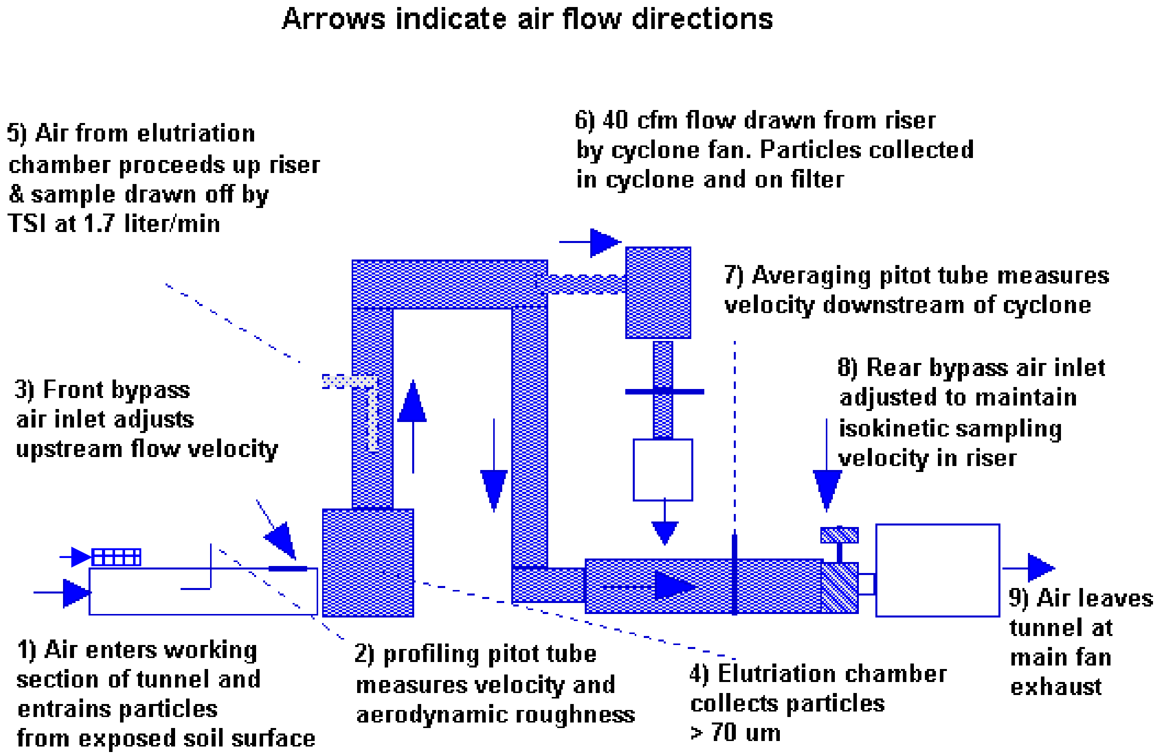
As air and particulates proceed up the riser, a small sample is pulled off by the TSI Dust-Trak® Model 8520 PM-10 monitor. The Dust-Trak® uses a small positive displacement pump that is set to operate at a fixed flow rate of 1.7 Liters/minute. The diameter of the TSI sampling inlet in the wind-tunnel riser is chosen to be 0.170 cm (1.7 mm) to provide a sampling velocity that is iso-kinetic with respect to the flow rate in the wind-tunnel riser section. This diameter was obtained using the tapered tip of a disposable volumetric pipette, trimmed to obtained the correct inside diameter, attached via to 1/8" copper pipe with a short section of Tygon tubing.

Figure 2 – Wind tunnel component diagram



The Dust-Trak® measures PM-10 concentrations in the range 0.000 to 19.99 mg/m^3. The instrument uses scattering of an infrared laser diode light beam to estimate PM-10 concentration. Air is drawn into the unit at a fixed rate of 1.7 liter per minute by a positive displacement pump, and passes through a built-in impacting head (50% aerodynamic cut size, 10 microns) before proceeding into a chamber where the suspended particle stream breaks the light beam.

Figure 3 – Wind tunnel process diagram – Small rectangular grid box shows location of ambient background TSI monitor



The units are factory-calibrated against a standard dust suspension, Arizona Road Dust. The TSI unit (serial number 21622) used on wind tunnel for profile and the erosion runs was factory-calibrated in late June of 2004, just prior to the start of the field testing in July 2004. Calibrations are good for one calendar year from the calibration date. The unit initially used for most of the ambient background, serial number 14088, was calibrated in July 2004. Two TSI DustTrak® units borrowed from the Regional Transportation Commission were used to record ambient background PM-10 data in the field in July 2004 until UNLV serial number 14088 was returned in a calibrated condition. Figures 3 and 6 show placement of the ambient background TSI DustTrak® monitor above the tunnel inlet to sample air just as it was drawn into the working section.

Table 3b – Summary of use and calibrations of TSI DustTrak® 8520 monitors used in 2004 field study.

TSI DustTrak Serial number and owner	Initial factory calibration date	2nd factory calibration date	Periods of use	Location of use
14088 – UNLV	June 2004	None	July 2004 – August 2004	Wind tunnel emissions measurements, profiling and erosion
21622 – UNLV	February 2001	July 2004	August 2004	Ambient background measurements

TSI DustTraks used in the field were zero-checked each morning with a sub-micron filter, and if zero-drift was detected, the instrument was adjusted to read zero following the procedure in the TSI manual. Zero checks were also performed at the conclusion of each day to determine if zero drift had occurred as a result of handling and temperature cycling. Observed drifts were very small, typically on the order of 0.003 mg/m^3 or less. TSI flow rates were checked for drift from the specified 1.7 L/minute flow rate every morning and every afternoon with the factory-supplied rotameter. Uncertainty of setting the TSI volumetric flow rate is +/- 0.02 L/minute. TSI clocks for the ambient background monitoring and PM-10 erosion were set at the start of each day to National Institute of Standards and Technology Time, using the www.nist.gov/time website.

DustTraks used for both ambient monitoring and for emissions measurements were programmed to sample the inlet gas stream every second for PM-10, and compute 10-second running averages of the raw PM-10 data. The 10-second running averages were stored every second. TSI data were downloaded daily and stored in separate folders on a Gateway personal computer running Windows XP Professional. There were separate folders for ambient PM-10 monitoring and another for wind tunnel PM-10 data recorded during velocity profiling and erosion runs.

After passing the TSI sampling port, particle-laden air in the riser makes a 90-degree turn and passes by the sampling orifice of the cyclone, filter, venturi and fan system (Figure 2). The venturi, fan motor and filter housing, from a standard General Metal Works (GMW) PM-10 atmospheric sampler, is equipped with a venturi orifice designed to choke air flow through sonic velocity, and thus make air flow independent of temperature and pressure. Design flow of the GMW rate is 40 cubic feet per minute.

The cyclone was built by UNLV to have a 50% physical cut size of 6.5 microns for approximately spherical particulates of density approximately 2.5 grams/cm^3. This physical diameter corresponds to an aerodynamic diameter of 10 microns for particles of density 1.0 gram/cm^3 for particles settling in Stokesian flow. After passing through the cyclone, air is drawn through a glass fiber filter for particle trapping before exhaust to the atmosphere (Figure 3).

After passing the cyclone orifice, the remaining flow proceeds through a reducing coupling into a 4-inch diameter ribbed plastic tube, and then enter the velocity box (Figure 2). The velocity box is a 6-foot long 4-inch diameter PVC pipe that is used for measurement of the total volumetric flow rate in the wind tunnel. A Dwyer Model DS-200-4 Flow Sensor averaging pitot tube is located 40 inches (10 diameters) downstream of the entrance to the velocity box. Pressure drop across this pitot tube is measured by a Dwyer Model 475 Mark II solid-state manometer with a range of 0.00-19.99 inches of water, a resolution of 0.01 inches of water, and an accuracy of 2%.

After passing the averaging pitot tube, flow enters the rear-bypass air inlet (Figures 2 and 3). The rear by-pass air inlet is adjusted to give a specified pressure drop in the averaging pitot tube, so that the flow sampling at the TSI Dust-Trak® inlet and the cyclone are nearly isokinetic. Typical averaging pitot pressure drop values were usually 3.28 ± 0.16 inches of water (mean + 1 standard deviation) with one minimum value below 3.00 (2.33 inches of water) and a maximum value of 3.93 inches of water. Occasionally, to attain the highest required sampling velocity, the rear air bypass was adjusted to increase the averaging flow rate to 3.40-3.50 inches of water, causing TSI and cyclone sampling to be slightly sub-isokinetic with respect to the surrounding flow.

After leaving the rear bypass, air is drawn into the fan section and exhausted from the system (Figures 2 and 3). The Dayton Model 4C108 10 5/8" diameter fan is powered by a 120 VAC 1-horsepower Dayton 5K901 electric motor, turning approximately 3250 rpm. At field sites, the electric motor is powered by a 5.5 horsepower Coleman portable AC generator.

2.2 Wind tunnel airflow balance

Intakes and withdrawals of air in the wind tunnel are graphically depicted in Figure 4. Air is drawn into the wind tunnel at front end of the working section and at the front bypass air inlet. The combined flow proceeds through the riser, where a small subsample is isokinetically withdrawn at 1.7 liters/minute by the TSI Dust-Trak®. A 40 cfm sample is then withdrawn from riser by the sampling tube connected to the cyclone, filter, venturi and filter fan subsystem. The flow then proceeds down the flexible PVC tube to the velocity box, where it is measured by the averaging pitot tube, and then blended with air drawn in from the rear bypass air inlet before entering the fan and being exhausted from the system.

Given that maximum airflow in the tunnel is 100 ft/sec, about 0.1 Mach, one can assume negligible air density changes in the tunnel, air mass flow rate balances can be converted into air volumetric flow rate balances. The corresponding volumetric air flow balance equations are shown in Figure 5. The key result is equation g, which shows that the sum of two unknown flow rates, Qdil + Qwork, is equal to the sum of two known or measured flows, Qavg + Qcyc,

(Equation 5g) Qdil + Qwork = Qavg + Qcyc

where:

Qdil	is the flow rate entering at the front bypass air inlet
Qwork	is the flow rate entering through the working section of the tunnel
Qavg	is the flow rate measured by the averaging pitot tube in the velocity box
Qcyc	is the known flow rate passing through the venturi in the cyclone-filter set.

This relationship is used to compute flux rates from the soil surface from wind tunnel measurements for each site and run.

Figure 4 – Wind tunnel airflow balance

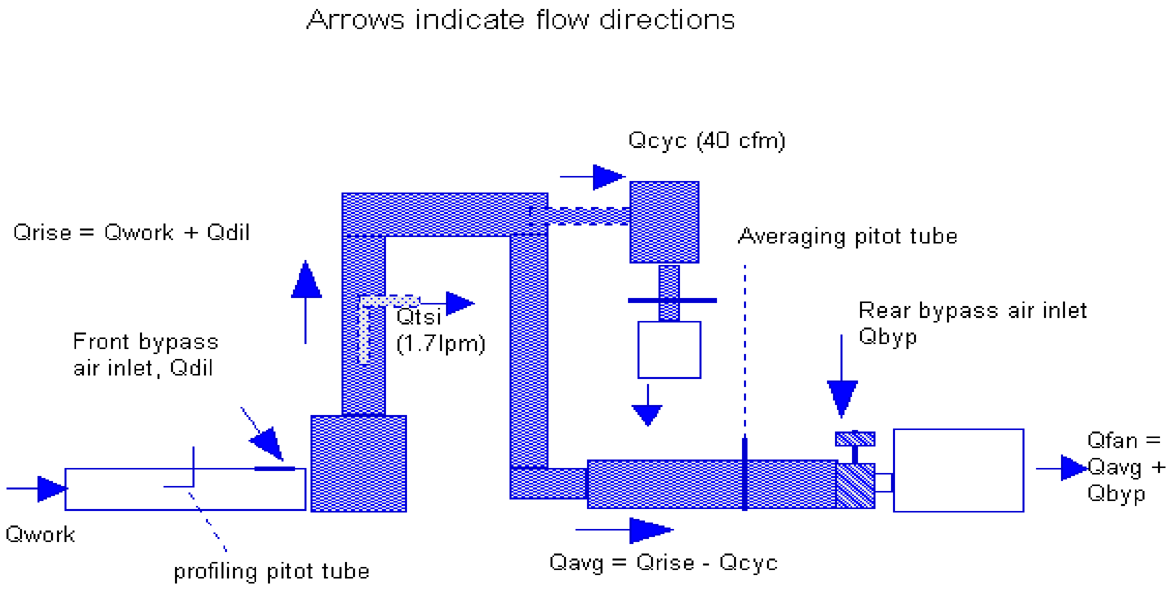


Figure 5 – Air flow balance equations

(Qtsi should be 1.7 liter/min)

Assuming negligible air density changes, then mass flow = volumetric flow
Primary equations:
a) Qrise = Qdil + Qwork
b) Qavg = Qrise - Qcyc
c) Qfan = Qavg + Qbyp

Measured or known:

Qavg	measured with averaging pitot just before fan
Qcyc	known, 40 cfm
Qtsi	known, 1.8 liter/min - assumed negligible in gas flow balance

Unknown:

Qdil	airflow in bypass inlet, can't be measured
Qwork	not known, but could be estimated from profiling pitot and aerodynamic Roughness

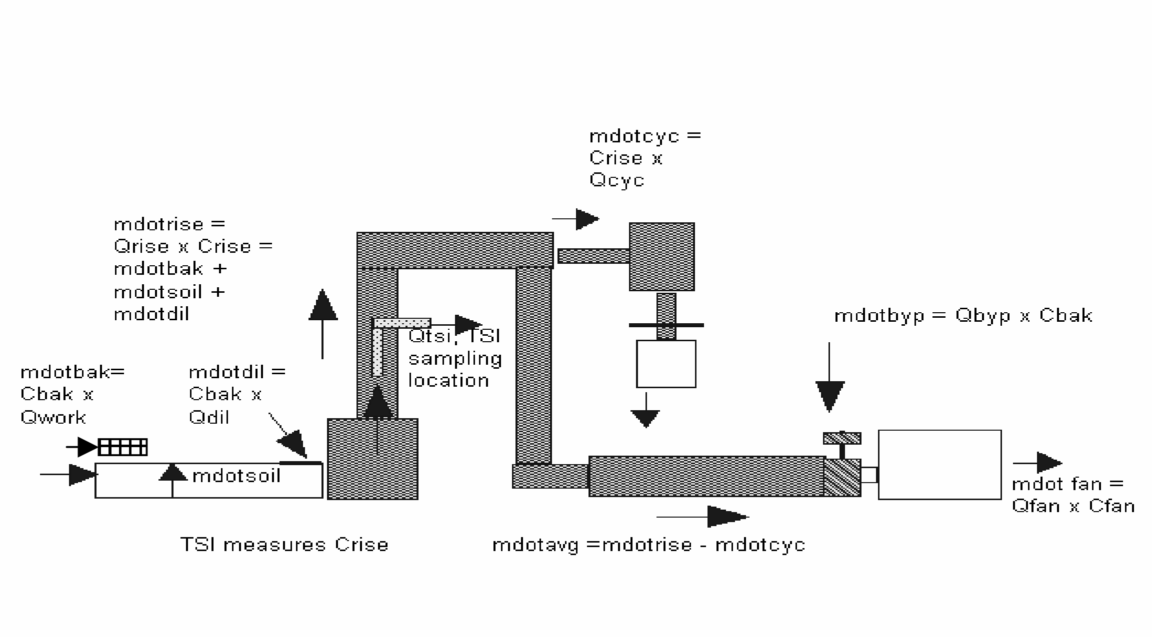
Derived equations:
d) From b, Qrise = Qavg + Qcyc
e) From a, Qdil = Qrise - Qwork
f) Subsitute d into e, obtain Qdil = Qavg + Qcyc - Qwork
g) Rearrange f to obtain, Qdil + Qwork = Qavg + Qcyc

With Qavg measured & Qcyc known, then Qdil + Qwork can be computed

2.3 Wind tunnel PM-10 mass balance and PM-10 flux calculation

Intakes and withdrawals of particulates are graphically depicted in Figure 6. The corresponding mass balance equations are shown in Figure 7. The term “mdot” in Figures 6 and 7 corresponds to a particulate mass flow rate in the system.

Figure 6 – Wind tunnel PM-10 mass balance (arrows indicates PM-10 mass fluxes) Small rectangular gridded box shows location of ambient background TSI monitor.



The purpose of Figure 7 is to lead the reader through the mathematics of the derivation of the PM-10 mass flow rate (shown as mdotsoil) from the soil surface in the tunnel working section. PM-10 mass balances and air flow balances from Figure 5 are used to develop an equation that estimates PM-10 flux rate from the soil surface in terms of known or measured quantities. Figure 7, equation p, shows the key relationship that is derived from the mass balance:

(Equation 7p) fluxsoil = [(Qavg + Qcyc) x (Crise - Cbak)] / [Tunnel floor area]

where:

fluxsoil	is the mass rate per unit area of PM-10 eroded from the soil surface in units of mass per area per time, in microgram per square meter per second.
Qavg	is the flow rate measured by the averaging pitot tube in the velocity box.
Qcyc	is the known flow rate passing through the venturi in the cyclone-filter set.
Crise	is the PM-10 concentration measured by the TSI Dust-Trak® in the tunnel. riser
Cbak	is the measured PM-10 atmospheric background concentration, measured either just prior to or just after the erosion run.

Tunnel floor area is the exposed area under the working section of the tunnel, 2.5 ft^2.

Measured, known or assumed quantities from each wind tunnel run are substituted into Equation 7p to compute the wind tunnel flux. An example flux calculation shown in Figure 8.

Figure 7 – Mass balance equations for PM-10 (mdot = mass flow rate)

Primary equations:
a) mdotfan = mdotbyp + mdotavg
b) mdot avg = mdotrise – mdotcyc
c) mdotrise = mdotdil + mdotsoil + mdotbak
d) mdotbak = Qwork x Cbak
e) mdotdil = Qdil x Cbak
f) mdotrise = Qrise x Crise

Measured, assumed or known:

Crise	Measured with TSI DustTrak®		
Cbak	Measured with TSI DustTrak®		
Tunnel floor area		0.5ft wide x 5 ft long =	2.5ft^2

Derived equations:
g) from c, mdotsoil = mdotrise - (mdotdil + mdotbak)
h) from d&e, mdotdil + mdotbak = (Qdil+Qwork) x Cbak
i) from Figure 1-5, equation g, Qdil+Qwork = Qavg + Qcyc
j) substitute i into h and h into g

to obtain mdotsoil = mdotrise - (Qavg + Qcyc) x Cbak
k) by c, mdotrise = Qrise x Crise
l) by Figure 5, equation d, Qrise = Qavg + Qcyc
m) therefore, mdotrise = (Qavg + Qcyc) x Crise
n) therefore, mdotsoil = (Qavg+Qcyc) x [Crise - Cbak]
o) fluxsoil = mdotsoil / Tunnel floor area
p) therefore, fluxsoil = [(Qavg + Qcyc) x (Crise - Cbak)] / [Tunnel floor area]

Figure 8 – Example of flux calculation

A. Raw Data

Qavg	440 cfm
Qcyc	40 cfm
Cbak	20 ug/m3
Crise	432 ug/m3 (average concentration over 16 minutes sampling period)
Tunnel floor	2.5 ft2

B. Conversion factors

0.305 m/ft
0.001 mg/ug
2.206E-06 lb/mg
0.0005 ton/lb
4047 m2/acre
60 min/hr

C. Flux calculation using Figure 7, equation p

fluxsoil =	[(440cfm + 40cfm) x (432 - 20ug/m3)] / [2.5ft2] ug-ft/m3/min =		7.91E+04 ug-ft/m3/min
fluxsoil =	7.91E+04 ug-ft/m3/min x 0.305 m/ft =		2.41E+04 ug/m2/min
fluxsoil =	2.41E+04 ug/m2/min	x 1 min / 60 sec =	4.02E+02 ug/m2/sec
fluxsoil =	4.02E+02 ug/m2/sec	x 3600 sec /hr x .001mg/ug =	1.45E+03 mg/m2/hour
fluxsoil =	1.45E+3 mg/m2/hour	x 4047 m2/acre	5.86E+06 mg/acre/hour
fluxsoil =	5.86E+06 mg/acre/hour	x 2.206E-06 lb/mg =	12.92 lb/acre/hour
fluxsoil =	12.92 lb/acre/hour	x 0.005 ton/lb =	6.46 E-02 ton/acre/hour

2.3 Wind tunnel field experiment procedure - 2004

2.4.1 Tunnel set and experiment procedure

The wind tunnel was transported disassembled in the back of a Chevrolet Suburban, and assembled at each site. A flat area approximately 15 feet long x 5 feet wide was needed for assembly of four rigidly-connected units, comprised of the tunnel flow conditioning section, tunnel working section, elutriation chamber, and support stand for the cyclone-filter combination. The other components (velocity box and fan), attached with a flexible corrugated PVC hose, could be arranged in a variety of locations behind the rigidly connected units.

The tunnel was assembled on the soil surface to perform a “stable progressive run”. After assembly, the ambient barometric pressure, atmospheric temperature and relative humidity were recorded, and the pressure gauges were zeroed.

The Wind Tunnel 2004 experiments were performed at each site by conducting three stable progressive runs and three unstable progressive runs. Nominal 10-meter velocity ranges were 15-20, 25-30, 30-35, and 40-45 mph in the same spot. For most of the sites, each velocity range was held constant for 4.0 min for at total erosion time of 16 minutes. Several two and half minute and three and a half minute durations were held early in the study until Clark County requested 4-minute run times. Table 5 in Section 2.4.3.1 describes the variations in site run times.

2.4.2 Estimating a velocity profile

The TSI Dust-Trak® was turned on and set to measure instantaneous PM-10 concentration for logging profiling data to memory at one second intervals for the 5-min profiling period. At the same time the tunnel fans and cyclone were turned on. The rear bypass air inlet was set to measure a pressure drop of about 3.20 inches of water to give a riser section flow velocity that was nearly isokinetic with the flow velocities of the cyclone and TSI Dust-Trak® sampling ports. During the profiling run, pressured readings were taken for 10 different pitot tube height positions. The tunnel fans and cyclone were then turned off after the 5-min period.

Recorded barometric pressure, air temperature, and profiling pitot pressure drop data were entered into a Microsoft Excel® spreadsheet on a laptop computer. A log transformation and linear regression routine were used to estimate both the aerodynamic roughness height, and a corresponding pitot tube centerline pressure drop that would correspond to the desired 10-meter erosion velocities. U* values corresponding to the erosion velocities, were also computed. An example data set for computing the velocity profile is shown in Tables 4a and 4b. Table 4a shows the raw data as collected during the surface profiling run for site 147 run 1. Table 4b shows the result of the least-squares fit to the data in Table 4a.

Example plots of the velocity profile data, showing the least-squares regression line, and subsequent extrapolations to obtain aerodynamic roughness height, U* and U10 are shown in Figures 9, 10, 11, 12 and 13.

Table 4a – Example data set for computing the velocity profile. Site WT147, run 1 - Stable

Pitot tube heights (cm)	**Measured Pressure (in H2O)**	**Pressure (Pascals)**	**Velocity (m/sec)**	**Loge (Pitot tube height, z) (cm)**	**linear fit velocity (m/sec)**			
8.21	**0.040**	9.96	4.30	2.105	4.37	**field temp**	**72.5**	**F**
5.63	**0.038**	9.46	4.19	1.728	4.21	**field pressure**	**27.05**	**in Hg**
4.96	**0.037**	9.21	4.14	1.602	4.16	1 atm =	29.92	in Hg
3.79	**0.036**	8.96	4.08	1.333	4.05	pressure	0.90	atm
2.84	**0.035**	8.72	4.02	1.044	3.94	temp	22.5	C
2.14	**0.033**	8.22	3.91	0.759	3.82	temp	295.7	K
1.59	**0.031**	7.72	3.79	0.464	3.70	R	0.0821	atm-m3/kgmole-K
1.18	**0.028**	6.97	3.60	0.166	3.58	MW	28.9	
0.99	**0.026**	6.47	3.47	-0.014	3.51	air density	1.08	kg/m3
0.93	**0.024**	5.98	3.33	-0.071	3.49	conversion	249	Pascal/in H20
0.42	**0.022**	5.48	3.19	-0.877	3.16	g	9.81	

Table 4b - Example data used in computing velocity profile. Site 147 run 1 - Stable

Regression results		
slope	Ao	0.403
intercept	A1	3.518
y = Ao(x)+A1		
r	0.98	
r^2	0.96	
k		0.4
Ao	=u*profile/k	
A1	=-(u*profile/k)lnzo	
u*profile (m/sec)	=k x Ao	0.161
zo (cm)	=exp(-A1/Ao)	1.61E-04

Figure 9 shows an example of a raw data plot of time-averaged velocity (y-axis) vs. natural logarithm of height (x-axis), as obtained from the field measurements. Velocity is the dependent variable, as it is a function of the applied wind stress and the surface roughness. Figure 10 shows a plot of data where height (log scale y-axis)) is plotted against velocity (x-axis). Velocity, still the dependent variable is plotted on the x-axis so that its dependence on height above the ground can be more easily visualized. A linear least-squares line is fit to the data, and the fit is extrapolated back to a point on the y-axis where the velocity is zero. Calculations on the lower left corner of the plot show how the roughness height is obtained from the extrapolated intercept.

Figure 9 - Example of velocity profile data plot – Site 147, run 1 Stable

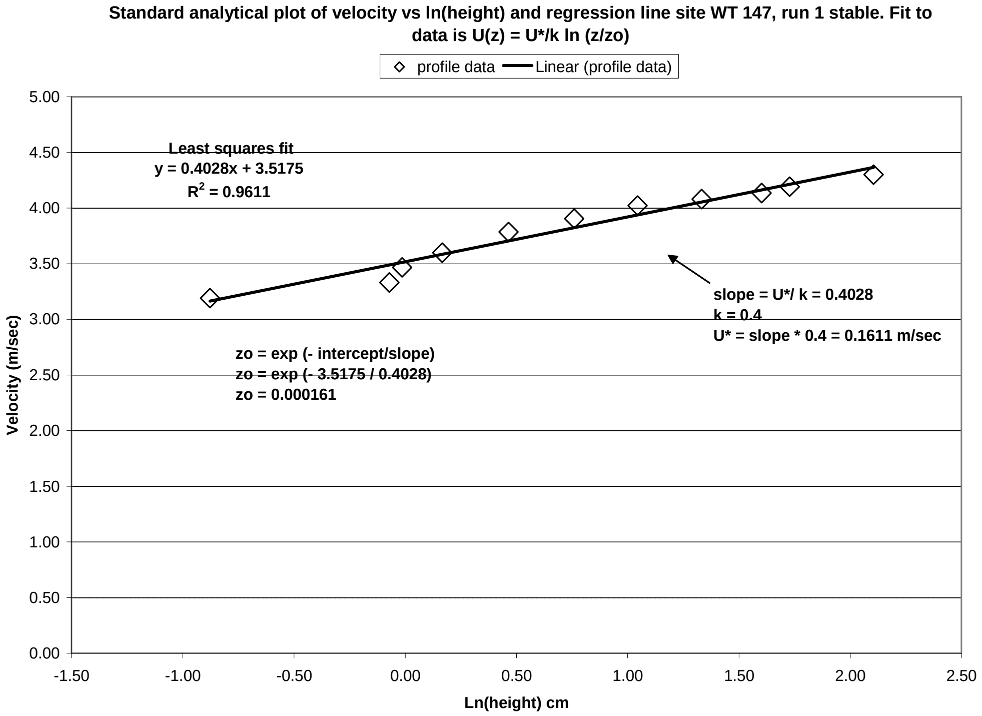


Figure 10 - Log-transformed and extrapolated data, axes reversed.

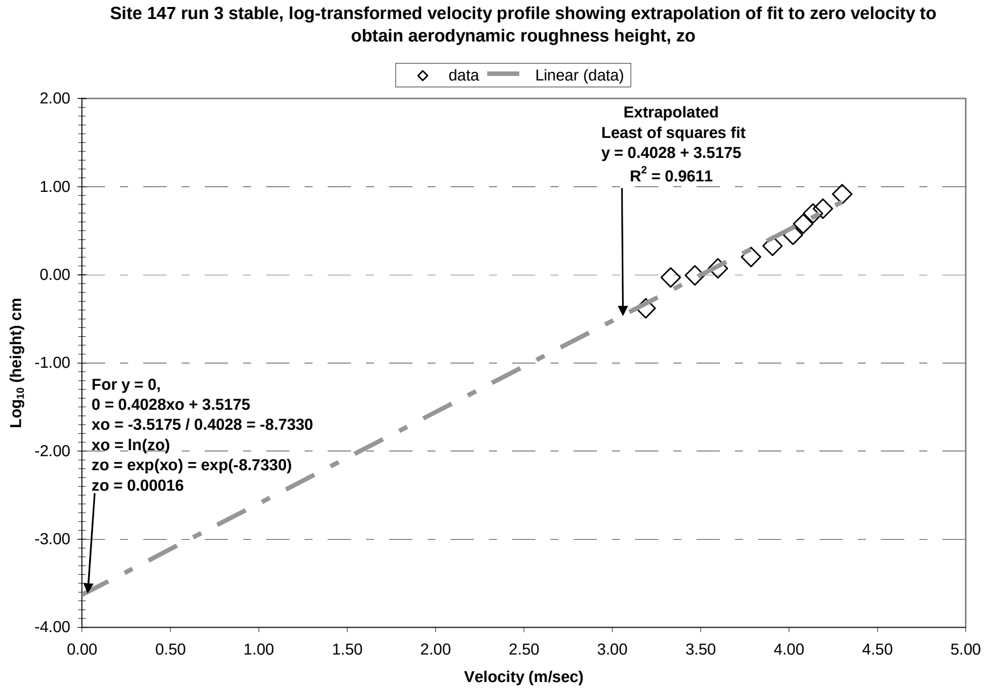


Figure 11 - Example of velocity profile using computed logarithmic data

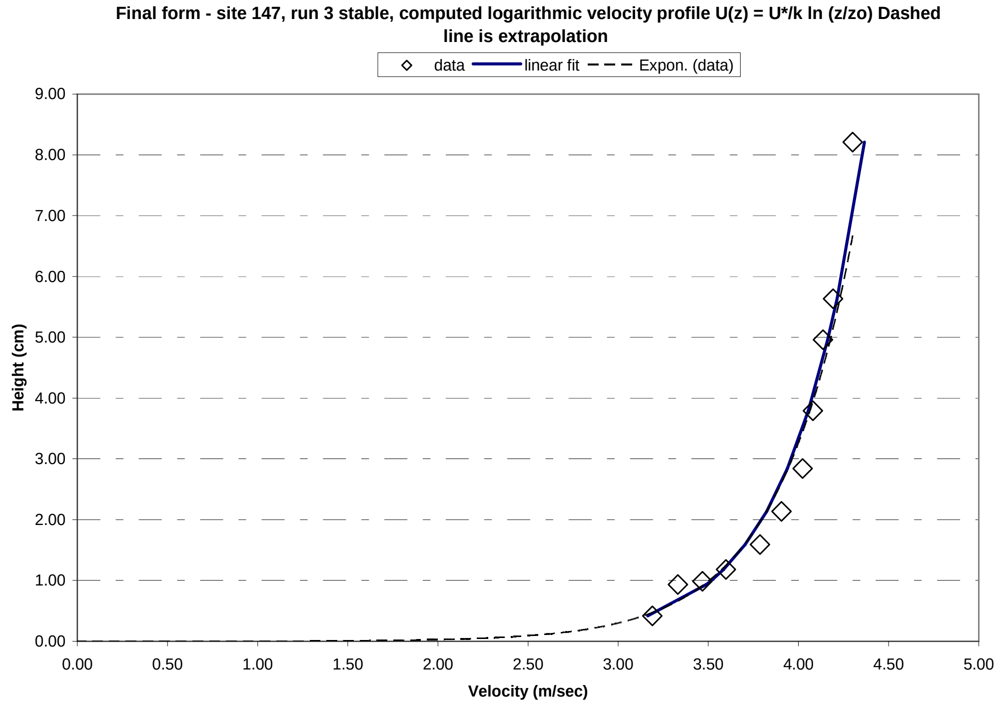


Figure 12 - Example of velocity versus height for 4 given 10 meter velocities

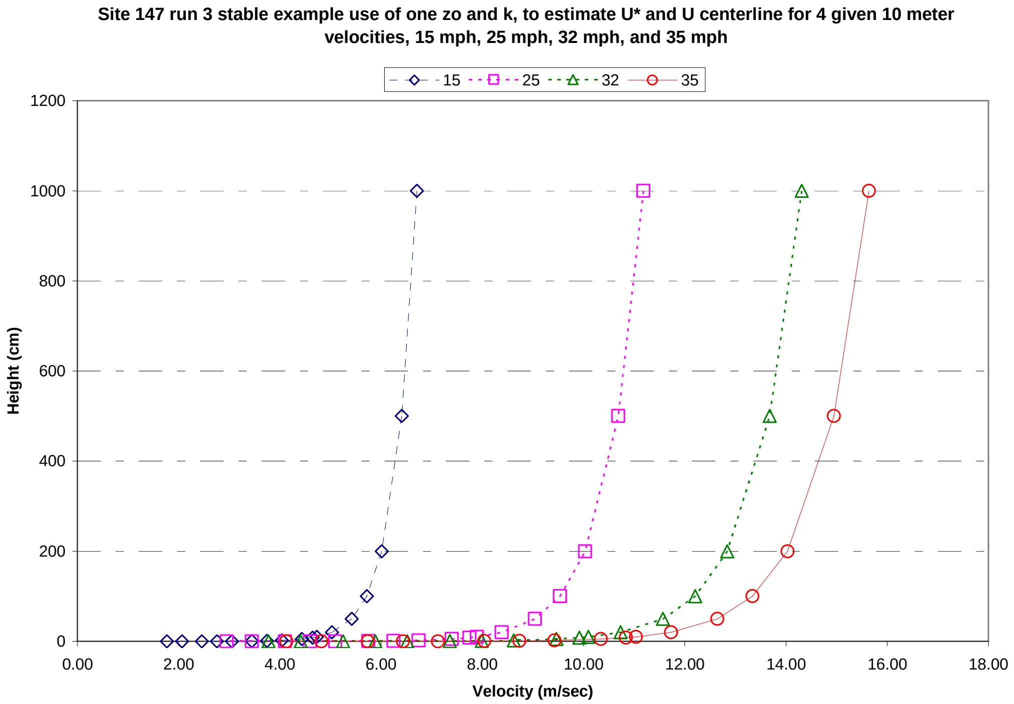
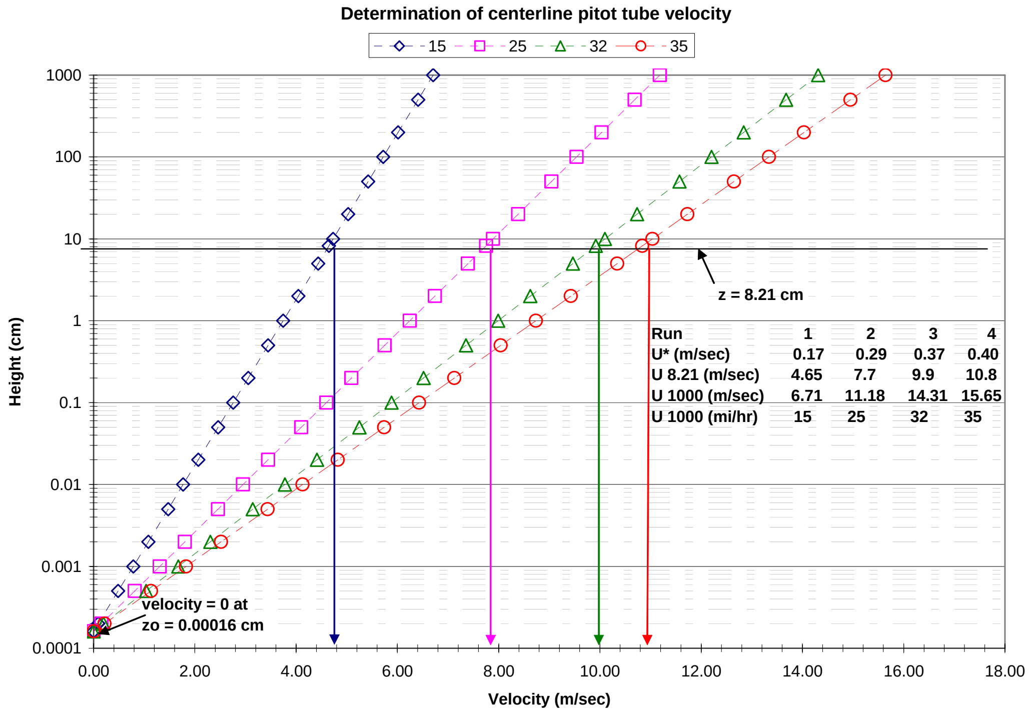


Figure 13 – Example of determination of centerline pitot tube velocity extrapolated data of site 147 stable run 1



Run	1	2	3	4
U* (m/sec)	0.17	0.29	0.37	0.40
U 8.21 (m/sec)	4.65	7.7	9.9	10.8
U 1000 (m/sec)	6.71	11.18	14.31	15.65
U 1000 (mi/hr)	15	25	32	35

A second TSI Dust-Trak® was turned on concomitantly with the first TSI Dust-Trak® and set to measure ambient PM-10 concentration for 5 minutes (profile-ambient). The result was recorded in the field datasheet.

The profile-ambient procedure was added about three weeks after the start of the 2004 wind tunnel field study. Consequently, some sites did not have profile-ambient background PM-10 measured. To replace this missing data, we decided to estimate ambient background during the profiling runs by calculating a weighted average ambient background PM-10 during the profiling period. We assumed that averaged ambient data changed smoothly in time from the previous erosion run to the subsequent erosion run. The time interval from the previous erosion run (N-1)d to the profile run (p) was typically 30 min. The time interval from profile run Np to erosion run Na was typically 15 min. We used a weighted average of the ambient background data recorded from runs (N-1)d and Na to calculate the ambient value for the missing ambient profile data. The formula used was ambient background, run Np = (1/3)*erosion background, run (N-1)d + (2/3)*erosion background, run Na. This procedure worked for all profiling runs except for run 1S (first stable run at a site)

However, for the first site profiling run (1Sp), we could not calculate the ambient background using this method because we did not have a prior erosion run (d) on that day. Instead, for run 1Sp, we calculated an average ambient background for erosion run 1S and used that as the ambient background for profiling run 1p.

Ambient profile values were estimated for 14 sites, comprised of sites 111, 113, 115, 116, 118, 122, 126, 127, 131, 132, 133, 134, 135, and 142. Ambient profile values were measured for 18 sites.

2.4.3 Erosion runs

After the profiling run, the TSI Dust-Trak® was then set to a 16 minute (10-min, 14-min for some sites, see variability in erosion runs duration time in Section 2.4.3.1.) datalogging mode, the tunnel fans were turned on, and the bypass damper was adjusted, if necessary, until the indicated pressure drop from the pitot tube reached the first designated 10-meter erosion velocity. After the first 4 minutes (2.5 min, 3.5 min for some sites) the bypass damper was closed again until the indicated pressure drop from the pitot tube reached the second designated 10-meter erosion velocity. This procedure was repeated two more times until the last progressive velocity was achieved. On occasion, the T-valve at the back of the wind tunnel was adjusted to increase overall flow rate for the last velocity level, making the tunnel flow velocity higher than the sampling velocity for the TSI Dust-Trak®. For cases where the T-valve was adjusted for the last velocity, the TSI's sampling flow was slightly subisokinetic with respect to the surrounding flow. Damper position, DPCalc® pitot tube centerline readings, and averaging flow sensor data for each 10-meter velocity were recorded in the field datasheet.

A second TSI Dust-Trak® was turned on concomitantly with the first TSI Dust- Trak® and set to measure ambient PM-10 concentration for 16-minutes (10-min, 14-min for some sites). The result was recorded in the field datasheet. For Site 132, ambient data was lost during download, so we used data from Clark County DAQEM webpage for the three nearest monitoring stations on that day to estimate background PM-10.

To signal the end of a run, the TSI display would blank at the end of the 16-minutes (10-min, 14-min for some sites), and the fans were turned off. Dust captured in the elutriation chamber and cyclone was brushed into new, pre-weighed Zip-Lock® plastic bags, and the glass fiber filter was changed.

Samples collected from the elutriation chamber and the cyclone were returned to the laboratory for weighing. Weight changes were determined with a Sargent-Welch electronic analytical balance with resolution of +/- 0.1 milligram (mg).

Glass fiber filters were pre-conditioned in a constant humidity chamber, within 15% ± 2%, weighed, sealed flat in large plastic Ziplock® bags, handled with latex gloves both when installed in the PM-10 sampler, and removed from the PM-10 filter mount in the field. After sampling, they were returned to the lab and reconditioned to the same relative humidity and temperature, and then reweighed. Filter weights were determined to +/- 0.1 milligram in a Sargent-Welch electronic balance. Experience in the 1995, 1998-99 and 2003 wind tunnel studies showed that, unless an unusually high PM-10 concentration was eroded from the soil surface, 10-minute wind tunnel sampling runs were of insufficient duration to obtain detectable weight changes on the glass fiber filters. For this reason, TSI Dust-Trak® PM-10 data were used to estimate PM-10 fluxes.

Additionally, since the 2004 study used progressive velocity increases, the collected saltation, cyclone or filter data do not correspond to any particular velocity during a run, but instead represent an integrated mass measurement. The mass data could be analyzed to determine if there are differences between stable and unstable soil surface conditions.

The wind tunnel working section was then removed from a stable site that had just been tested. The metal rake with tines at one inch spacing was used directly on a just-tested stable location to break up the crust and/or remove overlying non-erodible elements. The tunnel working section was then cleaned and repositioned over the freshly raked, now unstable site, and the tunnel was operated on the site to measure eroded dust and PM-10 concentrations as described above.

After completion of the unstable run, the tunnel was cleaned and reassembled in another subarea on the same site to perform a second run using the same procedure described above. After stable and unstable runs at the second subarea on the site, a third set of stable and unstable runs was also performed on another subarea at the site.

2.4.3.1 Variability of erosion run duration time

During this study, three different protocols for erosion run time were used. The first protocol used in this WT 2004 study was a total erosion time equals to 10 minutes. Second protocol was a total erosion time equals to 14 minutes and the third protocol was 16 minutes of total erosion time. The number and identity of sites tested under each protocol are listed in Table 5. The 16-minute protocol was established as the standard procedure after a conference telephone call between DAQEM, Midwest Research Institute, Environmental Quality Management and UNLV on July 21, 2004. All field erosion runs after July 21, 2004 were conducted for a duration of 16 minutes plus a 5.0 minute profile.

Table 5 – Erosion run - variability in time duration

Number of Sites	Site Number	Protocol
3	111, 122, 134	3 Stable and 3 Unstable, each with 5 minute profile + 4 progressive velocities, each 2.5 minutes (10 minutes total erosion). Total including profile: 15 minutes
5	113, 126, 127, 131, 142	3 Stable and 3 Unstable, each with 5 minute profile + 4 progressive velocities, each 3.5 minutes (14 minutes total erosion). Total including profile: 19 minutes
24	115, 116, 118, 119, 121, 123, 124, 125, 128, 130, 132, 133, 135, 136, 137, 138, 139, 140, 141, 143, 144, 146, 147, 148	3 Stable and 3 Unstable, each with 5 minute profile + 4 progressive velocities, each 4.0 minutes (16 minutes total erosion). Total including profile: 21 minutes

3 - Uncertainty analysis of wind tunnel measurements

A complete uncertainty analysis of wind tunnel measurements was developed for this report.

Uncertainties of individual field data, tabulated from manufacturers' specifications, are shown in Table 6. Short-term temporal fluctuations in field data, variability within and between sites, and weather variability between sampling days were all usually larger than individual instrument uncertainties. Short-term temporal fluctuations and spatial variations dominate the results of the uncertainty analyses presented below.

Uncertainties for derived quantities were determined as the square root of the sum of the squares of uncertainties of directly measured values, using the following formula, (Bevington, 1969, Holman, 1986.)

For a quantity, X, that is a function of parameters A, B, C . . ., X = f (A,B,C,…)

I.a) $wX = \{ [(\delta X/\delta A)wA]^2 + [(\delta X/\delta B)wB)]^2 + [(\delta X/\delta C)wC)]^2 + . . . \}^{1/2}$

where $\delta X/\delta A$, $\delta X/\delta B$, $\delta X/\delta C$, etc. represent the partial derivatives of X with respect to A, B, C, etc. respectively, and *w*A, *w*B, *w*C, etc., represent the experimental uncertainties of the parameters A, B, C, etc. respectively. The *w*’s can be the result of short-term temporal variations, spatial variations, or instrumental measurement uncertainties.

Table 6 – Summary of instrumental uncertainties

Instrument name	Manufacturer	Model number or Name	Accuracy	Readability / precision
DP-Calc™ digital micromanometer	TSI	8705	1% of reading at 21ºC	+/- 0.005 inches water
Pitot tube - profiling	Dwyer	160–12	see differential pressure gauge	see differential pressure gauge
Wind gauge	Nielsen-Kellerman	Kestrel 4000	+/- 3% of reading	+/- 0.1 mph
Thermometer	VWR	Electronic Digital Barometer	+/- 1ºC	+/- 0.1ºC
Barometer	VWR	Electronic Digital Barometer	+/- .1477 in Hg	+/- 0.01 inches Hg
Relative humidity	VWR	Electronic Digital Barometer	+/- 5% rh	+/- 1% rh
Balance	Sargent Welch	TLA 100	+/- 1.0 mg	+/- 0.1 mg
DustTrak® Aerosol Monitor	TSI	8520		+/- 0.1% reading or +/- .001 mg/m^3, whichever is greater
GPS	Garmin	eTrex	Variable depending on the number of satellites. Best case is 15 meters (49 feet) RMS* (0.49 seconds at equator)	+/- 0.001 minute of latitude or longitude (+/-0.06 second, or +/- 1.8 meters at the equator)
Electronic manometer	Dwyer	475-1-Mark II	+/- 0.5% full scale at 15-25ºC +/- 1.5 % full scale at 0-15 & 25-40ºC	+/- 0.01 inches H20
Flow sensor	Dwyer	DS-200-4	see electronic manometer	see electronic manometer

The partial derivatives represent the rate of change of the quantity X with respect to each parameter, and can be thought of as "weights" on the uncertainties. This method for estimating combined uncertainties, often termed Root-Mean Square error (RMS error), produces a weighted average estimate of the uncertainty of a derived quantity.

For example, for computation of gas density, $\rho = [P\ MW] / [R\ T]$

I.b) $w\rho = \{ [(\delta\rho/\delta P)wP]^2 + [(\delta\rho/\delta MW)wMW)]^2 + [(\delta\rho/\delta R)wR)]^2 + [(\delta\rho/\delta T)wT)]^2 \}^{1/2}$

When the partial derivatives are symbolically determined and substituted into the equation, and the result is divided by the formula for ρ, the following symbolic relationship for relative uncertainty of density, ρ, is obtained:

I.c) $w\rho/\rho = \{ [wP / P]^2 + [wMW / MW]^2 + [-wR/R]^2 + [-wT/T)]^2 \}^{1/2}$

Values of P, MW, R and T, and values of the uncertainties *w*P, *w*MW, *w*R, and *w*T, may be substituted into equation I.c to compute the relative uncertainty of gas density. For example, for

P = 0.920 atm	uncertainty, *w*P = 0.00167 atm
(from P = 27.53 inches Hg,	uncertainty, *w*P = 0.05 in Hg)
MW = 28.9 g/gmole	uncertainty, *w*MW = 0.2 g/gmole
R = 0.08206 atm-L/mole/ºK	uncertainty, *w*R = 0.0001 atm-L/mole/ºK
T = 294 ºK	uncertainty, *w*T = 0.55 ºK

$w\rho/\rho = \{ [0.00167 / .920]^2 + [0.2 /28.9]^2 + [-0.0001/.08206]^2 + [-0.55/294)]^2 \}^{1/2}$

$w\rho/\rho = \{ 5.62\text{x}10^{-5} \}^{1/2} = 7.50\text{x}10^{-3}$

and $\rho = [(0.92)\ (28.9)] / [\ (0.08206)\ (294)\ ] = 1.100\ \text{kg/m}^3$,

giving $w\rho = 7.50 \text{ x } 10^{-3} \text{ x } 1.100\ \text{kg/m}^3 = 0.008\ \text{kg/m}^3$.

In the 2004 Clark County wind tunnel field study, experimental uncertainties were estimated using the RMS approach for gas density, centerline velocity, 10-meter velocity, averaging pitot velocity, tunnel volumetric flow rate, and PM-10 flux.

For computation of flux uncertainty, F = [(Qriser+Qcyclone) x (Cmeas-Cback) / [Floor Area]

Id) $wF = \{ [(\delta F/\delta Qr)wQr]^2 + [(\delta F/\delta Qc)wQc]^2 + [(\delta F/\delta Cm)wCm)]^2 + [(\delta F/\delta Cb)wCb)]^2 + [(\delta F/\delta A)wA)]^2 \}^{1/2}$

Tables 7 through 12 present uncertainty results for quantities used in determination of the PM-10 emission factors. Summary for estimated relative uncertainty for each parameter are shown below:

Table	Parameter	Estimated relative uncertainty	
		worst case	**best case**
7	air density	0.75%	0.75%
8	centerline velocity	13%	4%
8	10 meter velocity	17%	12%
9	tunnel volumetric flow rate	6%	4%
10	tunnel floor area	0.50%	0.50%
10	others	see Table 10 and Tables 11 and 12	
11	PM-10 flux - low riser flow uncertainty	71%	7%
12	PM-10 flux - high riser flow uncertainty	71%	10%

Tables 11 and 12 present uncertainty results for PM-10 emission factors (flux in ton/acre/hr) for several combinations of riser flow uncertainty and PM-10 concentration.

Table 7 – Uncertainty analysis of air density calculations

Scenario	**1 – Best case**	**2 – Worst case**	**Cause of Uncertainty**
	Low temp, Low press	**High temp, high press**	
Formula	**$\rho = m/V = P\ MW / RT$**	**$\rho = m/V = P\ MW / RT$**	
P (inches Hg)	27.53	28.43	
*w*P (inches Hg)	0.05	0.05	uncertainty in last digit of display
*w*P/P	1.82E-03	1.76E-03	
T ºR	530.0	570.0	
*w*T ºR	1.0	1.0	resolution of thermometer
*w*T/T	1.89E-03	1.75E-03	
MW (g/gmole)	28.9	28.7	
*w*MW (g/gmole)	0.2	0.2	variation in composition with relative humidity changes
*w*MW/MW	6.92E-03	6.97E-03	
R (atm-L/gmole-K)	0.08206	0.08206	
*w*R	0.0001	0.0001	+/- 1 in last digit
*w*R/R	1.22E-03	1.22E-03	
Sum of squares	5.62E-05	5.62E-05	
RMS uncertainty, ($w\rho$ / ρ)	7.50E-03	7.50E-03	
RMS (%)	0.750	0.750	
density, ρ (kg/m^3)	1.100	1.049	
RMS $w\rho$ /2 +/- (kg/m^3)	0.004	0.004	

Table 8 – Uncertainty analysis of centerline and 10 meter velocities

Scenario	**1 – Best case**	**2 – Worst case**	**Source of uncertainty**
Instrument	profiling pitot tube	profiling pitot tube	
measurement	centerline ΔP	centerline ΔP	
Conditions	Best case	Worst case	
Formula	$V = k[2\Delta P/\rho\,]^{1/2}$	$V = k[2\Delta P/\ \rho\,]^{1/2}$	
Typical data			
ΔP, inches H20	0.160	0.160	
+/- uncert in meter reading, in H_20	0.005	0.020	Ambient air velocity fluctuations
cause	meter readability	cross wind fluctuation	see "cause" in each column
$w\Delta P$ inches H_20 (= 2x fluct)	0.010	0.040	
$w\Delta P$ / ΔP	**6.25E-02**	**2.50E-01**	
ρ (kg/meter^3)	1.06	1.06	
$w\rho$ (kg/meter^3)	0.008	0.008	from density calculation
$w\rho$ / ρ	**7.55E-03**	**7.55E-03**	
k (pitot constant)	1.000	1.000	
*w*k	0.020	0.020	variation in k for +/- 5º alignment error
***w*k/k**	**0.020**	**0.020**	
Sum of squares $\Sigma(wX/X)^2$	1.39E-03	1.60E-02	
$wV/V = [\Sigma(wX/X)^2]^{1/2}$	3.73E-02	1.27E-01	
RMS uncert *w*V/V in %	**3.7%**	**12.7%**	V = centerline velocity at z1 = 7.6 cm
Scenario for U10	**1**	**2**	**Units & source of uncertainty**
Computed centerline velocity	9.2	9.2	m/sec
Uncertainty, wV	0.3	1.2	m/sec
Computed centerline velocity	20.6	20.6	mph
Uncertainty, wV	0.8	2.6	mph
sample aero roughness, zo	0.100	0.100	cm
uncertainty, *w*zo	0.010	0.010	cm, estimate from regression
centerline height, z1	7.60	7.60	cm
uncertainty, *w*z1	0.10	0.10	cm, wobble in pitot adjustment
wind measurement height, z2	1000	1000	cm
(RMS term *w*rt zo)^2	1.27E-02	1.27E-02	
(RMS term *w*rt z1)^2	9.23E-06	9.23E-06	
(RMS term wrt V, wV/V)^2	1.39E-03	1.60E-02	
RMS uncert *w*(U10)/(U10) %	**11.9%**	**17.0%**	
extrapolated U(10)	43.7	43.7	mph
uncertainty *w*(U10)	5.2	7.4	mph

Table 9 – Uncertainty analysis of averaging pitot velocity and tunnel volumetric flow rate

Scenario	1 – Best case	2 – Worst case	Source of uncertainty
Instrument	averaging pitot tube	Averaging pitot tube	
measurement	ΔP at 4 locations	ΔP at 4 locations	
Conditions	Best case	Worst case	
Formula	$V = k[2\Delta P/\rho\ ]^{1/2}$	$V = k[2\Delta P/\rho\ ]^{1/2}$	
Typical data			
ΔP, inches H_20	3.200	3.200	
+/- uncert in meter reading	0.050	0.150	
cause	fan pulsation	Cross winds	see "cause" in each column
$w\Delta P$ inches H_20 (= 2x fluct)	0.100	0.300	
$w\Delta P$ / ΔP	**3.13E-02**	**9.38E-02**	
ρ kg/meter^3)	1.06	1.06	
$w\rho$ (kg/meter^3)	0.008	0.008	from density calculation, **Table C3**
$\Delta\rho$ / ρ	**7.55E-03**	**7.55E-03**	
k (pitot constant)	0.600	0.600	
Δk	0.020	0.020	variation in k for +/- 5º alignment error
wk/k	**3.33E-02**	**3.33E-02**	
Sum of squares $\Sigma(\Delta X/X)^2$	1.37E-03	3.32E-03	
$\Delta V/V = \ [\Sigma\ (wX/X)^2]^{1/2}$	3.70E-02	5.76E-02	
RMS uncert wV/V in (%)	**3.7**	**5.8**	
Computed velocity (m/sec)	24.7	24.7	
RMS uncertainty $\underline{+}$ (m/sec)	0.9	1.4	
Computed velocity (mph)	55.2	55.2	
RMS uncertainty $\underline{+}$ (mph)	2.0	3.2	
Pipe cross section	round	Round	
Volumetric flow conversion	$Q = V\ (\pi\ \text{diam}^2\ /\ 4)$	$Q = V\ (\pi\ \text{diam}^2\ /\ 4)$	
pipe diam (inches)	4.00	4.00	
pipe diam (feet)	0.333	0.333	
pipe area (ft^2)	0.087	0.087	
velocity ft/min)	4856	4856	
approximate wall correction	1.00	1.00	
flow rate (ft^3/ min)	424	424	
flow rate uncertainty (ft^3/ min)	16	24	

Table 10 – Sources of uncertainty in flux calculations

Variable	Typical value	Source of uncertainty
Working section length (inches)	60	
*w*Length (inches)	3.13E-02	measurement uncertainty, tape (1/32nd inch = 0.0313 inches)
w**Length/Length**	**5.21E-04**	
Working section width (inches)	6	
*w*Width (inches)	3.13E-02	measurement uncertainty, tape
w**Width/Width**	**5.21E-03**	
Area (ft^2)	2.500	
*w*Area (ft^2)	1.31E-02	RMS error computed from length, width uncertainties
WArea/Area	**5.23E-03**	
Qavg (cfm)	424	
*w*Qavg / Qavg	5.76E-02	Max fluctuation in meter reading from cross winds, fan oscillations
*w*Qavg (cfm)	24	Computed from pitot probe fluctuations
Qcyc (cfm)	40.0	
*w*Qcyc (cfm)	1.0	Assumed venturi choke flow uncertainty
w**Qavg/(Qavg+Qcyc)**	**5.26E-02**	
w**Qcyc/(Qavg+Qcyc)**	**2.16E-03**	
Crise (ug/m^3)	1000	
Cbak ug/m^3)	20	
Crise - Cbak (ug/m^3)	980	
*w*Crise ug/m3	200	If large, RMS error of fluctuating TSI signal. If small, uncertainty in
wCrise/(Crise-Cbak)	**2.04E-01**	individual TSI measurement. See flux calculation scenarios
*w*Cbak (ug/m^3)	10	Uncertainty in assumed clean air background PM-10
w**Cbak/(Crise-Cbak)**	**1.02E-02**	

Table 11 – Flux calculation – uncertainty analysis scenarios for low riser flow uncertainty and several riser concentrations

Scenario	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
riser concentration	high	high	high	medium	medium	medium	low	low	low
riser concentr uncert	high	medium	low	high	medium	low	high	med	low
Typical site	unstable lands	unstable lands		stable lands	stable lands		stabilized lands	stabilized lands	stabilized lands
Surface condition							torn up		not torn up
Riser flow uncertainty	low	low	low	low	low	low	low	low	low
Data									
Area ft^^{2}	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500
*w*Area ft^^{2}	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013
***w*Area/Area**	**5.23E-03**	**5.23E-03**	**5.23E-03**	**5.23E-03**	**5.23E-03**	**5.23E-03**	**5.23E-03**	**5.23E-03**	**5.23E-03**
Qavg (cfm)	468	468	468	468	468	468	468	468	468
Qcyc (cfm)	40	40	40	40	40	40	40	40	40
Qavg+Qcyc (cfm)	508	508	508	508	508	508	508	508	508
wQavg (cfm)	21	21	21	21	21	21	21	21	21
***w*Qavg/(Qavg+Qcyc)**	**4.13E-02**	**4.13E-02**	**4.13E-02**	**4.13E-02**	**4.13E-02**	**4.13E-02**	**4.13E-02**	**4.13E-02**	**4.13E-02**
*w*Qcyc (cfm)	1	1	1	1	1	1	1	1	1
***w*Qcyc/(Qavg+Qcyc)**	**1.97E-03**	**1.97E-03**	**1.97E-03**	**1.97E-03**	**1.97E-03**	**1.97E-03**	**1.97E-03**	**1.97E-03**	**1.97E-03**
Crise (ug/m^{3})	1000	1000	1000	200	200	200	40	40	40
Cbak (ug/m^{3})	20	20	20	20	20	20	20	20	20
Crise - Cbak (ug/m^{3})	980	980	980	180	180	180	20	20	20
wCrise (ug/m^{3})	200	100	50	50	20	10	10	6	2
wCrise/(Crise-Cbak)	**2.04E-01**	**1.02E-01**	**5.10E-02**	**2.78E-01**	**1.11E-01**	**5.56E-02**	**5.00E-01**	**3.00E-01**	**1.00E-01**
wCbak (ug/m^{3})	10	10	10	10	10	10	10	10	10
wCbak/(Crise-Cbak)	1.02E-02	1.02E-02	1.02E-02	5.56E-02	5.56E-02	**5.56E-02**	**5.00E-01**	**5.00E-01**	**5.00E-01**
Σ(wX/X)^{2}	4.35E-02	1.23E-02	4.45E-03	8.20E-02	1.72E-02	7.91E-03	5.02E-01	3.42E-01	2.62E-01
RMS uncert [Σ(wX/X)^{2}]$^{1/2}$	**2.09E-01**	**1.11E-01**	**6.67E-02**	**2.86E-01**	**1.31E-01**	**8.90E-02**	**7.08E-01**	**5.85E-01**	**5.12E-01**
RMS uncertainty (%)	**21**	**11**	**7**	**29**	**13**	**9**	**71**	**58**	**51**
flux (ton/acre/hr)	1.63E-02	1.63E-02	1.63E-02	2.99E-03	2.99E-03	2.99E-03	3.32E-04	3.32E-04	3.32E-04
RMS uncer (ton/acre/hr)	.34E-02	.18E-02	.11E-02	.86E-03	.39E-03	.27E-03	2.35E-04	1.94E-04	1.7E-04

Table 12 – Flux calculation – uncertainty analysis scenarios high riser flow uncertainty and several riser concentrations

Scenario	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
riser concentration	high	high	high	medium	medium	medium	low	low	low
riser concentr uncert	high	medium	low	high	medium	low	high	med	low
Typical site	unstable lands	unstable lands		stable lands	stable lands		stabilized lands	stabilized lands	stabilized lands
Surface condition							torn up		not torn up
Riser flow uncertainty	high	high	high	high	high	high	high	high	high
Data									
Area (ft^2)	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500
wArea (ft^^{2})	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013
wArea/Area	**5.23E-03**	**5.23E-03**	**5.23E-03**	**5.23E-03**	**5.23E-03**	**5.23E-03**	**5.23E-03**	**5.23E-03**	**5.23E-03**
Qavg (cfm)	438	438	438	438	438	438	438	438	438
Qcyc (cfm)	40	40	40	40	40	40	40	40	40
Qavg+Qcyc (cfm)	478	478	478	478	478	478	478	478	478
wQavg (cfm)	43	43	43	43	43	43	43	43	43
wQavg/(Qavg+Qcyc)	**9.00E-02**	**9.00E-02**	**9.00E-02**	**9.00E-02**	**9.00E-02**	**9.00E-02**	**9.00E-02**	**9.00E-02**	**9.00E-02**
wQcyc (cfm)	1	1	1	1	1	1	1	1	1
wQcyc/(Qavg+Qcyc)	**2.09E-03**	**2.09E-03**	**2.09E-03**	**2.09E-03**	**2.09E-03**	**2.09E-03**	**2.09E-03**	**2.09E-03**	**2.09E-03**
Crise (ug/m^3)	1000	1000	1000	200	200	200	40	40	40
Cbak (ug/m^3)	20	20	20	20	20	20	20	20	20
Crise - Cbak (ug/m^3)	980	980	980	180	180	180	20	20	20
wCrise (ug/m^3)	200	100	50	50	20	10	10	6	2
wCrise/(Crise-Cbak)	**2.04E-01**	**1.02E-01**	**5.10E-02**	**2.78E-01**	**1.11E-01**	**5.56E-02**	**5.00E-01**	3.00E-01	1.00E-01
wCbak (ug/m^3)	10	10	10	10	10	10	10	10	10
wCbak/(Crise-Cbak)	**1.02E-02**	**1.02E-02**	**1.02E-02**	**5.56E-02**	**5.56E-02**	**5.56E-02**	**5.00E-01**	**5.00E-01**	**5.00E-01**
Σ(wX/X)^2 –add bold entries	**4.99E-02**	**1.86E-02**	**1.08E-02**	**8.84E-02**	**2.36E-02**	**1.43E-02**	**5.08E-01**	**3.48E-01**	**2.68E-01**
RMS flux uncertainty [Σ(wX/X)^2]$^{1/2}$	2.23E-01	1.37E-01	1.04E-01	2.97E-01	1.53E-01	1.20E-01	7.13E-01	5.90E-01	5.18E-01
RMS flux uncertainty in (%)	**22**	**14**	**10**	**30**	**15**	**12**	**71**	**59**	**52**
flux (ton/acre/hr)	1.53E-02	1.53E-02	1.53E-02	2.81E-03	2.81E-03	2.81E-03	3.12E-04	3.12E-04	3.12E-04
RMS flux uncer in ton/acre/hr = flux x RMS uncert	.34E-02	.21E-02	.16E-02	.84E-03	.43E-03	.34E-03	2.23E-04	1.84E-04	1.62E-04

When the relative uncertainty of riser flow rate is low (4%), and with PM-10 background uncertainty of ± 10 µg/m^3, the following emission factor uncertainty results are obtained. Corresponding combinations displayed in Table 13 are underlined. * = not physically real.

Table 13 – PM-10 emission factor uncertainty for low riser flow rate uncertainty

Average riser PM-10 concentration	**40 µg/m^3**	**200 µg/m^3**	**1000 µg/m^3**
Short-term riser PM-10 fluctuations	**PM-10 flux relative uncertainty**		
+/- 10 µg/m^3	71%	9%	4%
+/- 20 µg/m^3	112%	13%	5%
+/- 50 µg/m^3	*	29%	7%
+/- 100 µg/m^3	*	56%	11%
+/- 200 µg/m^3	*	*	21%

When the relative uncertainty of riser flow rate is high (9%), with a PM-10 background uncertainty of ± 10 µg/m^3, the following emission factor uncertainty results are obtained. Corresponding combinations displayed in Table 14 are underlined. * = not physically real.

Table 14 – PM-10 emission factor uncertainty for high riser flow rate uncertainty

Average riser PM-10 concentration	**40µg/m^3**	**200µg/m^3**	**1000µg/m^3**
Short-term riser PM-10 fluctuations	**PM-10 flux relative uncertainty**		
+/- 10 µg/m^3	71%	12%	9%
+/- 20 µg/m^3	112%	15%	9%
+/- 50 µg/m^3	*	30%	10%
+/- 100 µg/m^3	*	57%	14%
+/- 200 µg/m^3	*	*	22%

Tables 13 and 14 show that flux (emission factor) relative uncertainties tend to plateau at the riser flow rate uncertainty for conditions where the relative uncertainty in PM-10 riser concentration is small (low fluctuations and a high average PM-10 concentration). This corresponds to physical conditions where the stochastic fluctuations in the TSI-measured PM-10 signal are small.

Relative uncertainties in flux estimates are highest for conditions where the riser PM-10 concentration is low and uncertainties in riser and background PM-10 concentrations are high. Physically, this corresponds to occasions when the tunnel is measuring fluxes from stabilized surfaces that generate low amounts of PM-10.

4 - 1995 repeatability study

In late 1995, a field repeatability study was conducted with the portable wind tunnel in an effort to test RMS theory predictions and estimate the inherent variability of PM-10 measurements from an experimental surface.

About 3 cubic feet of soil were collected in five 5-gallon plastic buckets from WT 078, an unstable site with one of the highest measured PM-10 production rates, located on the east side of the Las Vegas Valley near the intersection of Mountain Vista and Gold Dust. Bucket contents were thoroughly mixed prior to application.

A one-inch thick, one foot wide, eight foot long, uniform layer of soil was placed on a level concrete pad in the utility yard of the UNLV College of Engineering, a site partially shielded from the wind by a 10-foot high wall. The top surface was smoothed with flat cardboard, and then indented with about 1/8" of surface relief with corrugated cardboard. The cardboard was removed and the portable wind tunnel was placed on the soil, with the flaps sealed to the surface with more soil from the site. The wind tunnel was operated at a fixed flow rate, and PM-10 filter, cyclone, saltation, and TSI measurements were obtained.

Eight controlled runs were conducted at the same tunnel flow rate, with each run conducted on a new batch of soil. (Soil from the previous run was swept up before new soil was applied to the concrete pad). Results of these eight controlled are shown in Table 15.

Table 15A - Results of 1995 experimental repeatability study

Run Number	**Saltation**	**Cyclone**	**Filter**	**TSI PM-10**
	Mass (mg)	**Mass (mg)**	**Mass (mg)**	**Mass (mg)**
D003	10,086.3	124.5	171.9	0.05949
C001	4,853.3	141.8	36.0	0.03835
C002	7,366.1	353.0	72.0	0.05722
D004	6,137.5	167.0	37.0	0.04166
E001	2,201.3	198.0	108.4	0.02516
E002	10,527.4	644.2	17.3	0.07374
E003 (g)	11,822.9	871.1	123.4	0.06267
E004	594.6	94.4	111.9	0.01115
Average	6,698.7	324.3	84.7	0.0462
Std. dev	4,036.3	285.1	53.1	0.0210
Coefficient of variation (%)	**60**	**88**	**63**	**45**
Average – 1 std dev (mg)	2,662.3	39.2	31.6	0.0252
Average (mg)	6,698.7	324.3	84.7	0.0462
Average + 1 std dev (mg)	10,735.0	609.3	137.9	0.0672
Flow rate (cfm)	440	40	40	
Flow rate (liter/min)				1.7
Avg concentration (mg/m^3)	53.8	28.6	7.48	2.72

Table 15A shows that the average TSI PM-10 mass collected was 46.2 µg, with a standard deviation of 21.0 µg, giving a coefficient of variation (CV) of 21.0/46.2 = 0.45, or 45%, for an average riser concentration of 2.72 mg/m^3 (2,720 µg/m^3). This CV was lower than for the other collected size fractions, but higher than the theoretical uncertainty estimates for single measurements of high riser PM-10 concentrations shown in Tables 12 and 14.

A controlled repeatability study on identical soil surfaces was not performed in 2004. DustTrak® PM-10 sampling techniques were identical in the 2004 field study, but the method of application of wind stress to the soil surface was much different.

In 1995, a three or four wind speeds were each applied for a 10 minute interval, with each wind speed being higher than the previous one. The tunnel was shut down and cleaned between each wind speed. The tunnel was used at only one location at each site.

In 2004, one low wind speed was applied for a 5.0 minute interval, then four wind speeds were each applied for a (usually) a 4.0 minute interval, with each wind speed being higher than the previous one. The wind speeds were applied in steps during one long 21 minute (5+4+4+4+4) run. The tunnel was not shut down for cleaning between each wind speed. The tunnel was used at three locations at each site, and each location was sampled in both the stable and unstable conditions.

On many of the sites, the tunnel was operated on the three locations at the same target fixed wind speeds of 25, 35 and 45 mph. These similar wind speeds at three locations at each site allow computation of the within-site uncertainty of the emissions factors by computing averages and standard deviations separately for the 25, 35 and 45 mph emissions factors over the three locations at each site. Coefficients of variation for each wind speed at each site were then computed as the ratio of the standard deviation to the average. Finally, averages and standard deviations of the coefficients of variation were computed over the different sites at each wind speed. Table 15B shows the averaged coefficients of variation for PM-10 emissions factors, averaged over all wind erodibility groups, at the 25, 35 and 45 mph wind speeds. The computed averages range from 50% to 65%. Although obtained in the field from a variety of wind erodibility groups, these values are slightly higher than the 45% coefficient of variation from the eight-sample 1995 wind tunnel experimental repeatability study.

Table 15B – Coefficients of variation of PM-10 emissions factors calculated for cases where wind speeds were 25, 35, and 45 mph.

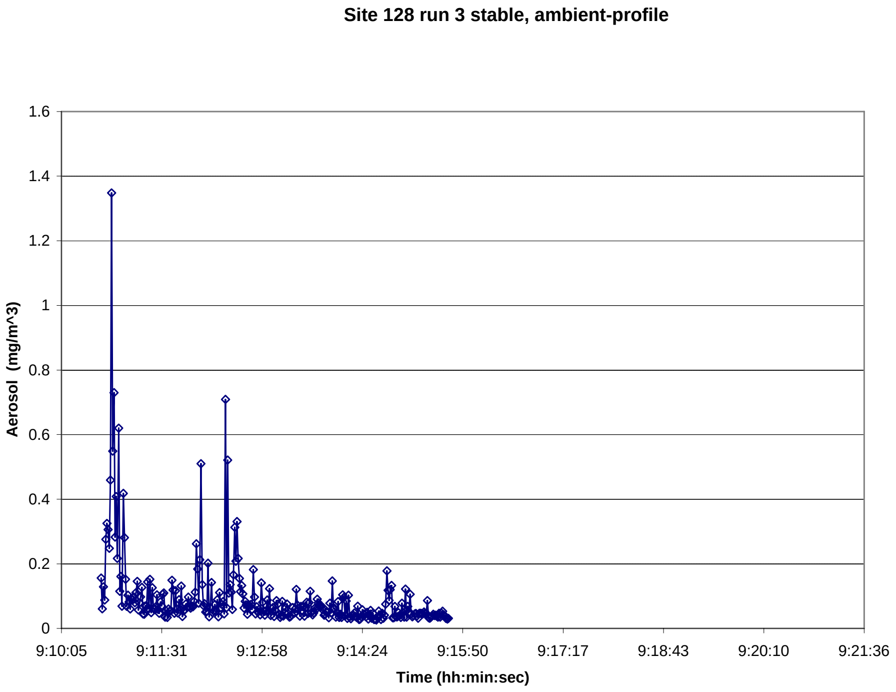
Wind speeds (mph)	Stable Average Coefficient of Variation +/- Standard Deviation	# sites used to compute Stable CV	Unstable Average Coefficient of Variation +/- Standard Deviation	# sites used to compute Unstable CV
25	65% +/- 33%	21	50% +/- 36%	16
35	59% +/- 24%	21	52% +/- 27%	16
45	50% +/- 27%	19	50% +/- 32%	16

5 - Data processing

5.1 How TSI data are converted into fluxes

The TSI aerosol (mg/m^3) raw data for every profile, erosion and ambient background runs were downloaded daily into the computer and an Excel® spreadsheet file was created for every run. PM-10 mass, in milligrams, was calculated by multiplying aerosol concentration by flow rate for every second of the run. A graph was plotted showing PM-10 (mg/m^3) versus time in seconds. Example of stable and unstable ambient background during a profile run, profile run, ambient background during erosion, and erosion run are shown in Figures 14, 15, 16 and 17, respectively.

Figure 14 – Examples of ambient background during profile run



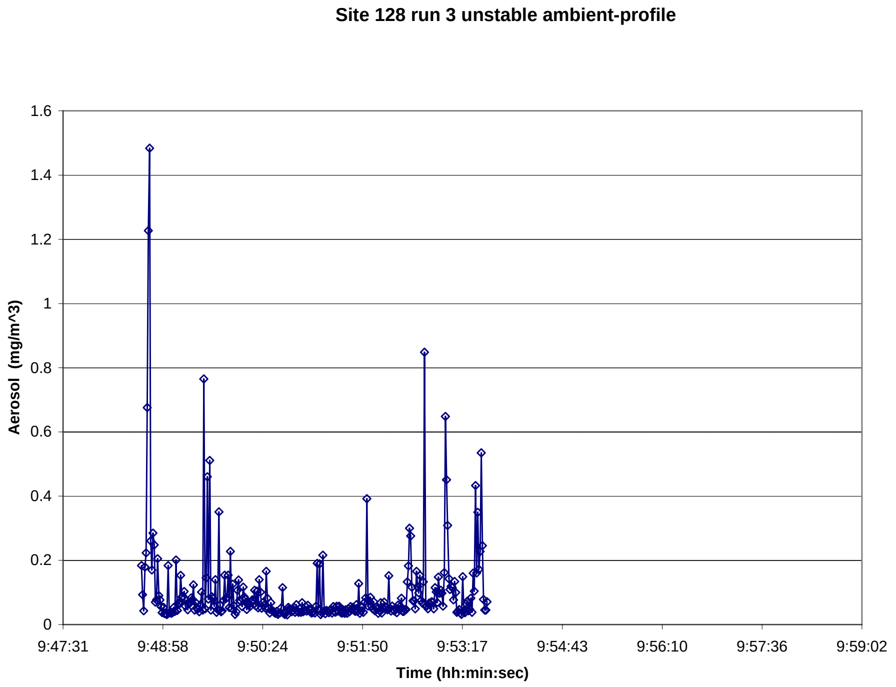
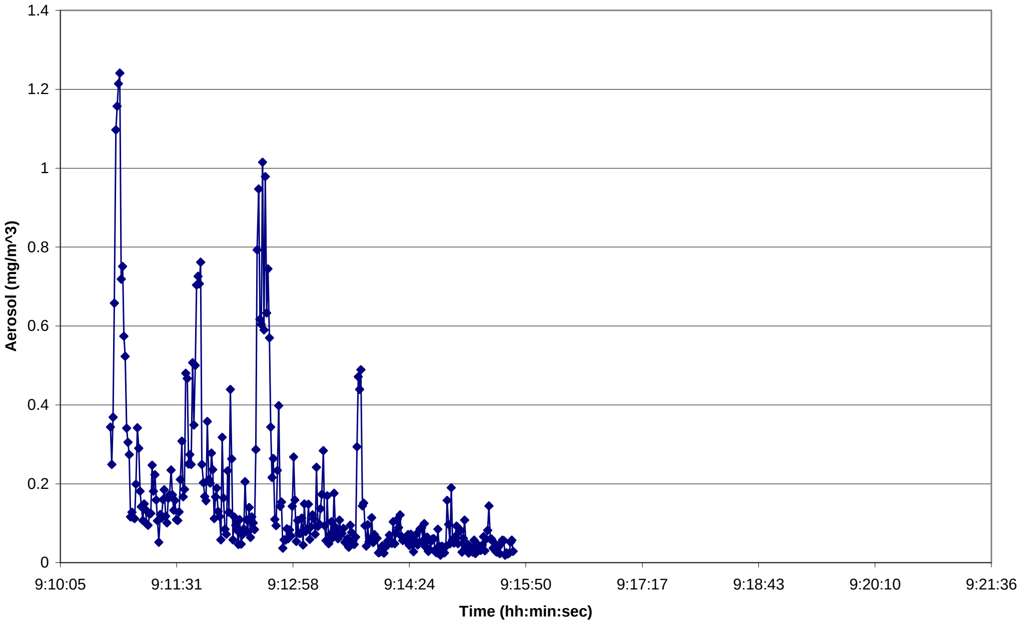


Figure 15 – Examples of profile runs

Site 128 Run 3 stable - profile run



Site 128 Run 3 unstable - profile run

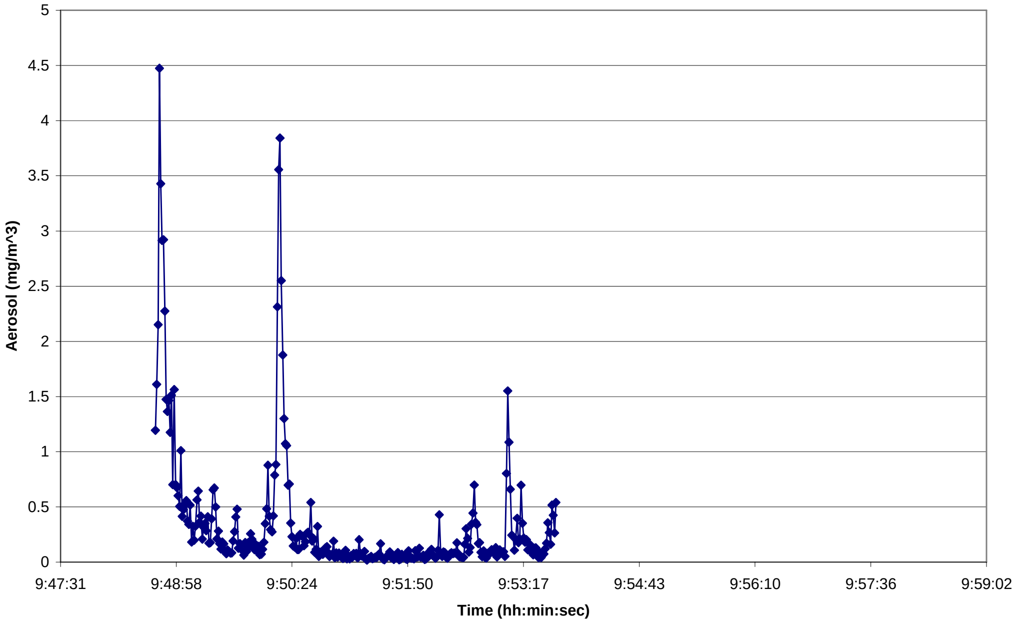
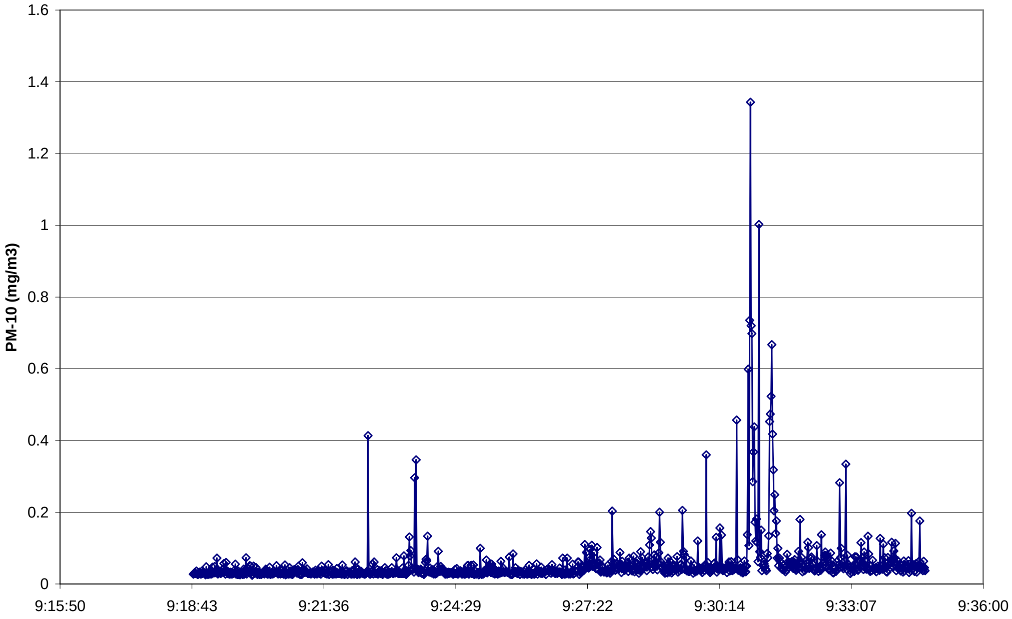


Figure 16 – Examples ambient background during erosion runs

Site 128 run 3 stable - ambient background



Site 128 run 3 unstable - ambient background

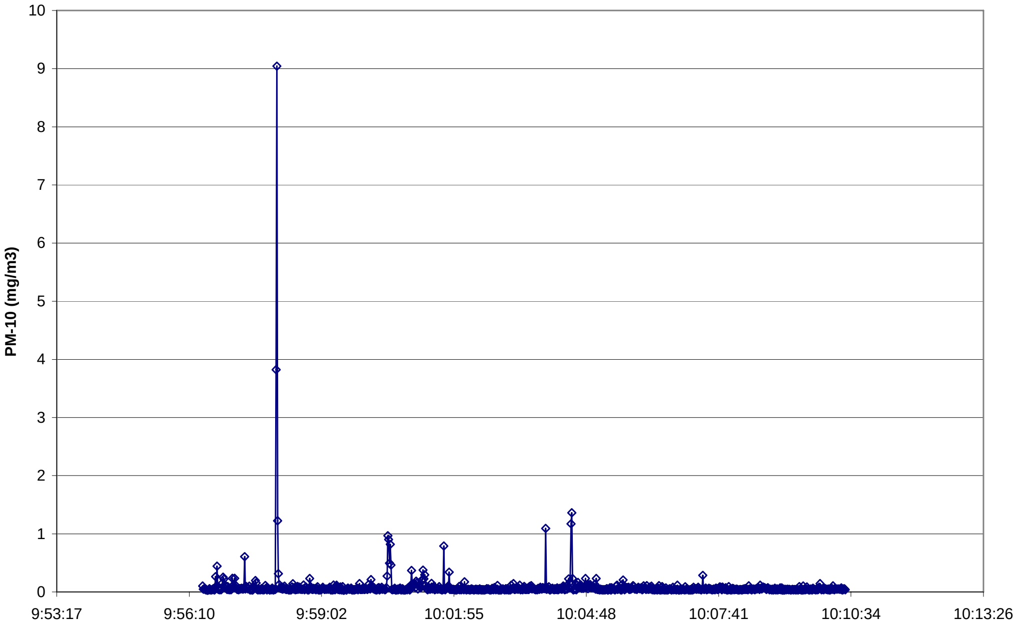
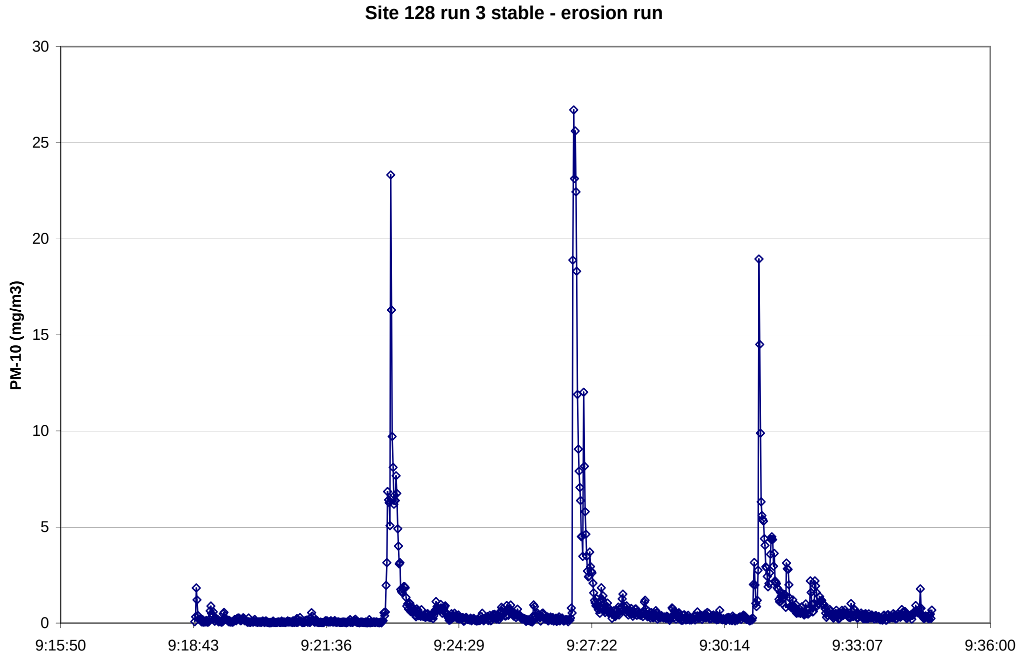
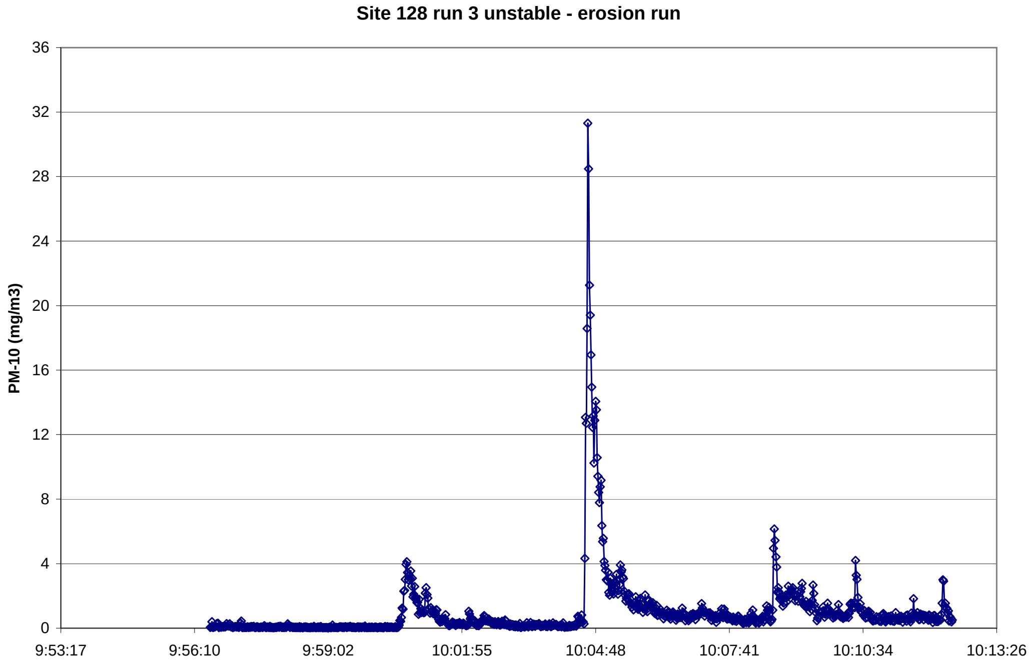


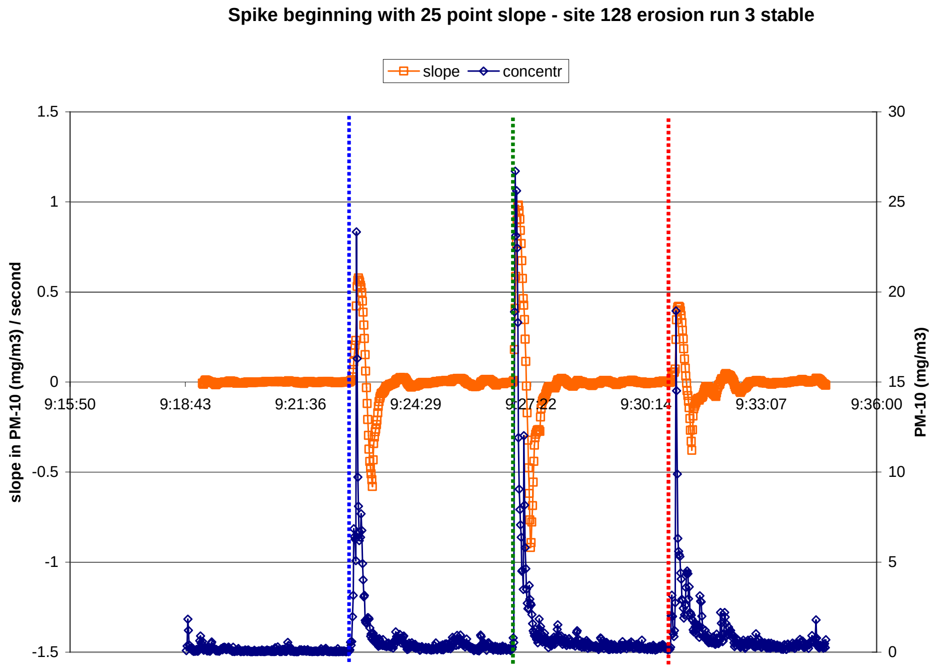
Figure 17 – Examples of erosion runs





For both erosion and profile runs, PM-10 “spikes” or “microbursts” were separated from the main signal by using a 25-point running slope calculation (Figures 18 and 19).

Figure 18 – Examples of the cut of the erosion signal in the beginning of a spike



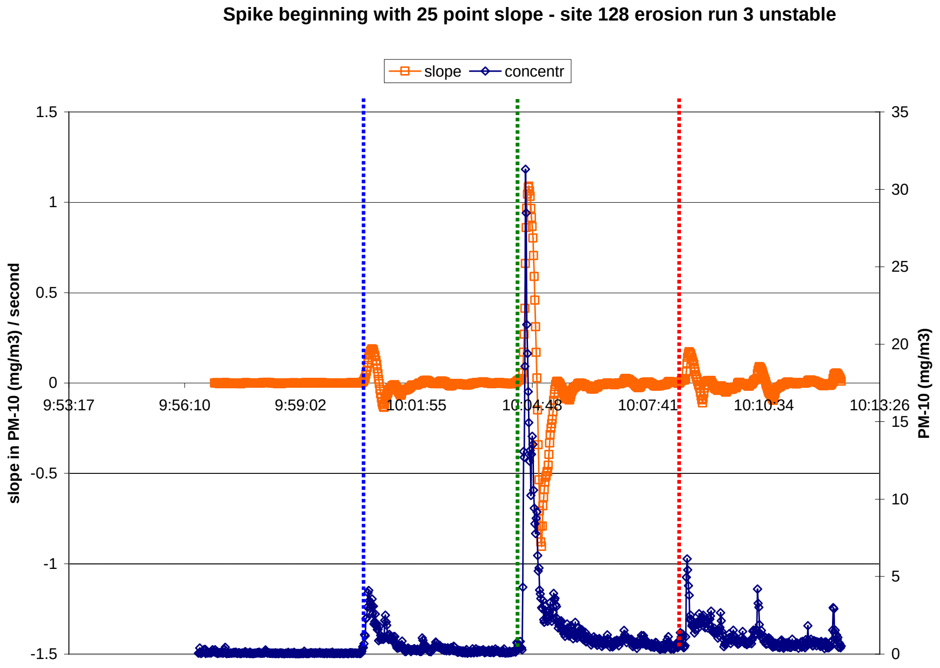
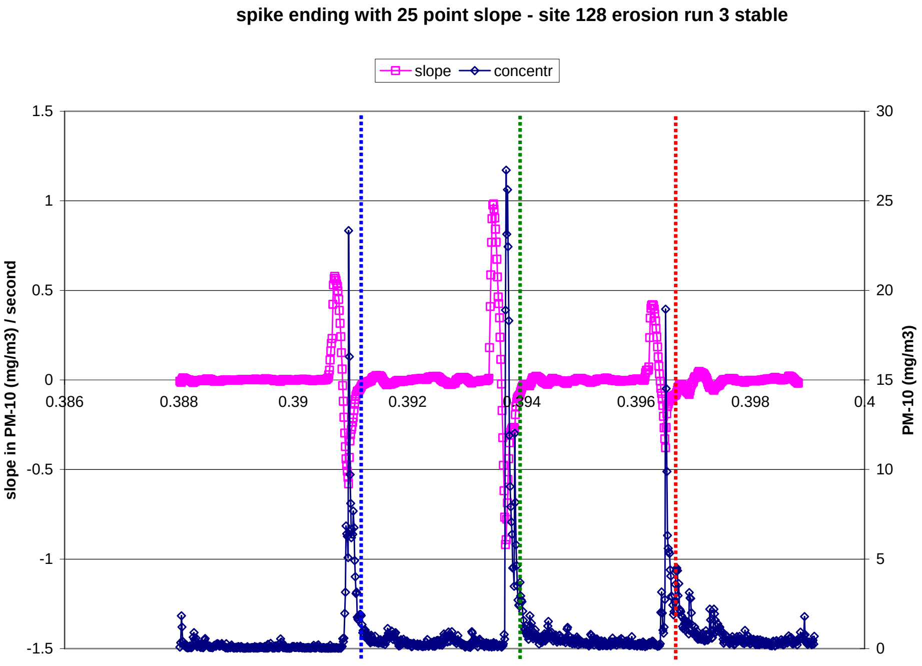
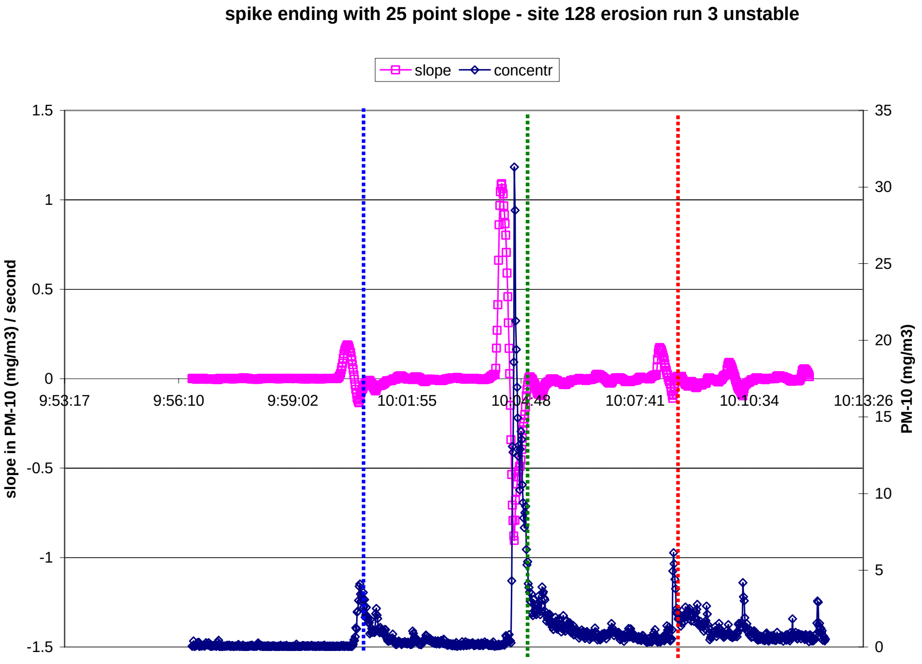


Figure 19 – Examples of the cut of the erosion signal in the ending of a spike





Data summary sheets were created to calculate corrected average PM-10 concentration and net mass for tunnel PM-10 and ambient PM-10 during the profiling run (Table 16a and 16b).

Table 16a – Examples of summary table for ambient background during profile run

Uncorrected concentration calculator								
Site 128 Prof-Amb R3S speed range	Speed End time (Enter this value)	elapsed time (seconds)	total concentr (mg/m3-sec) at speed end	**uncorrected average concentr (mg/m3)**				
1	**9:15:41**	300	2.85E+01	**9.50E-02**				
Spike calculator								
speed	Speed start time (Enter this value)	elapsed time (seconds)	mass at start time (mg)	Spike end time (Enter this value)	elapsed time (seconds)	mass at spike end time (mg)	**net spike mass (mg)**	**spike duration (seconds)**
1	**9:10:42**	1	2.65E-04	**9:10:59**	18	1.10E-02	**1.10E-02**	**18**
Corrected concentration calculator								
speed	spike end time	speed end time	nonspike duration (sec)	total concentr (mg/m3-sec) at spike end	total concentr (mg/m3-sec) at speed end	**corrected (non-spike) average concen-tration (mg/m3)**		
1	9:10:59	9:15:41	282	6.48E+00	2.85E+01	**7.81E-02**		

Uncorrected concentration calculator								
Site 128 Prof-Amb R3UN speed range	Speed End time (Enter this value)	elapsed time (seconds)	total concentr (mg/m3-sec) at speed end	**uncorrected average concentr (mg/m3)**				
1	**9:53:41**	300	3.11E+01	**1.04E-01**				
Spike calculator								
speed	Speed start time (Enter this value)	elapsed time (seconds)	mass at start time (mg)	Spike end time (Enter this value)	elapsed time (seconds)	mass at spike end time (mg)	**net spike mass (mg)**	**spike duration (seconds)**
1	**9:48:42**	1	3.13E-04	**9:48:55**	14	8.87E-03	**8.87E-03**	**14**
Corrected concentration calculator								
speed	spike end time	speed end time	nonspike duration (sec)	total concentr (mg/m3-sec) at spike end	total concentr (mg/m3-sec) at speed end	**corrected (non-spike) average concen-tration (mg/m3)**		
1	9:48:55	9:53:41	286	5.22E+00	3.11E+01	**9.05E-02**		

Table 16b – Examples of summary table of PM-10 erosion data - profile runs

Uncorrected concentration calculator								
Site 128 Profile R3S speed range	Speed End time (Enter this value)	elapsed time (seconds)	total concentr (mg/m3-sec) at speed end	**uncorrected average concentr (mg/m3)**				
1	**9:15:41**	300	5.17E+01	**1.72E-01**				
Spike calculator								
speed	Speed start time (Enter this value)	elapsed time (seconds)	mass at start time (mg)	Spike end time (Enter this value)	elapsed time (seconds)	mass at spike end time (mg)	**net spike mass (mg)**	**spike duration (seconds)**
1	**9:10:42**	1	5.85E-04	**9:10:59**	18	1.73E-02	**1.73E-02**	**18**
Corrected concentration calculator								
speed	spike end time	speed end time	nonspike duration (sec)	total concentr (mg/m3-sec) at spike end	total concentr (mg/m3-sec) at speed end	**corrected (non-spike) average concen-tration (mg/m3)**		
1	9:10:59	9:15:41	282	1.02E+01	5.17E+01	**1.47E-01**		

Uncorrected concentration calculator								
Site 128 Profile R3UN speed range	Speed End time (Enter this value)	elapsed time (seconds)	total concentr (mg/m3-sec) at speed end	**uncorrected average concentr (mg/m3)**				
1	**9:53:41**	300	1.02E+02	**3.40E-01**				
Spike calculator								
speed	Speed start time (Enter this value)	elapsed time (seconds)	mass at start time (mg)	Spike end time (Enter this value)	elapsed time (seconds)	mass at spike end time (mg)	**net spike mass (mg)**	**spike duration (seconds)**
1	**9:48:42**	1	2.03E-03	**9:48:55**	14	4.87E-02	**4.87E-02**	**14**
Corrected concentration calculator								
speed	spike end time	speed end time	nonspike duration (sec)	total concentr (mg/m3-sec) at spike end	total concentr (mg/m3-sec) at speed end	**corrected (non-spike) average concen-tration (mg/m3)**		
1	9:48:55	9:53:41	286	2.87E+01	1.02E+02	**2.57E-01**		

Data summary sheets were also created to calculate corrected average PM-10 concentration and net mass for tunnel PM-10 and ambient PM-10 background for each velocity during the erosion runs (Table 17a and 17b).

Table 17a – Examples of summary tables of ambient background erosion runs

Uncorrected concentration calculator								
Site 128 Ambient R3S speed range	Speed End time (Enter this value)	elapsed time (seconds)	total concentr (mg/m3-sec) at speed end	**uncorrected average concentr (mg/m3)**				
1	**9:22:48**	244	8.55E+00	**3.50E-02**				
2	**9:26:53**	489	1.82E+01	**3.94E-02**				
3	**9:30:50**	726	3.14E+01	**5.56E-02**				
4	**9:34:44**	960	5.47E+01	**9.95E-02**				
Spike calculator								
speed	Speed start time (Enter this value)	elapsed time (seconds)	mass at start time (mg)	Spike end time (Enter this value)	elapsed time (seconds)	mass at spike end time (mg)	**net spike mass (mg)**	**spike duration (seconds)**
1	**9:18:45**	1	4.59E-05	**9:18:58**	14	7.19E-04	**7.19E-04**	**14**
2	**9:22:48**	244	1.45E-02	**9:23:25**	281	1.67E-02	**2.15E-03**	**38**
3	**9:26:53**	489	3.09E-02	**9:27:24**	520	3.33E-02	**2.34E-03**	**32**
4	**9:30:50**	726	5.33E-02	**9:31:22**	758	6.94E-02	**1.61E-02**	**33**
Corrected concentration calculator								
speed	spike end time	speed end time	nonspike duration (sec)	total concentr (mg/m3-sec) at spike end	total concentr (mg/m3-sec) at speed end	**corrected (non-spike) average concen-tration (mg/m3)**		
1	9:18:58	9:22:48	230	4.23E-01	8.55E+00	**3.53E-02**		
2	9:23:25	9:26:53	208	9.81E+00	1.82E+01	**4.03E-02**		
3	9:27:24	9:30:50	206	1.96E+01	3.14E+01	**5.72E-02**		
4	9:31:22	9:34:44	202	4.08E+01	5.47E+01	**6.84E-02**		

Uncorrected concentration calculator								
Site 128 Ambient R3UN speed range	Speed End time (Enter this value)	elapsed time (seconds)	total concentr (mg/m3-sec) at speed end	**uncorrected average concentr (mg/m3)**				
1	**10:00:33**	244	3.22E+01	**1.32E-01**				
2	**10:04:33**	484	5.37E+01	**8.95E-02**				
3	**10:08:34**	725	6.80E+01	**5.93E-02**				
4	**10:12:29**	960	8.03E+01	**5.23E-02**				
Spike calculator								
speed	Speed start time (Enter this value)	elapsed time (seconds)	mass at start time (mg)	Spike end time (Enter this value)	elapsed time (seconds)	mass at spike end time (mg)	**net spike mass (mg)**	**spike duration (seconds)**
1	**9:56:30**	1	1.75E-04	**9:56:31**	2	2.58E-04	**2.58E-04**	**2**
2	**10:00:33**	244	5.48E-02	**10:00:59**	270	5.96E-02	**4.79E-03**	**27**
3	**10:04:33**	484	9.13E-02	**10:05:06**	517	9.64E-02	**5.15E-03**	**34**
4	**10:08:34**	725	1.16E-01	**10:08:48**	739	1.17E-01	**1.59E-03**	**15**
Corrected concentration calculator								
speed	spike end time	speed end time	nonspike duration (sec)	total concentr (mg/m3-sec) at spike end	total concentr (mg/m3-sec) at speed end	**corrected (non-spike) average concen-tration (mg/m3)**		
1	9:56:31	10:00:33	242	1.52E-01	3.22E+01	**1.33E-01**		
2	10:00:59	10:04:33	214	3.51E+01	5.37E+01	**8.72E-02**		
3	10:05:06	10:08:34	208	5.67E+01	6.80E+01	**5.42E-02**		
4	10:08:48	10:12:29	221	6.89E+01	8.03E+01	**5.14E-02**		

Table 17b – Examples of summary tables – erosion runs

Uncorrected concentration calculator								
Site 128 Erosion R3S speed range	Speed End time (Enter this value)	elapsed time (seconds)	total concentr (mg/m3-sec) at speed end	**uncorrected average concentr (mg/m3)**				
1	**9:22:48**	244	2.84E+01	**1.16E-01**				
2	**9:26:53**	489	2.60E+02	**9.45E-01**				
3	**9:30:50**	726	6.00E+02	**1.44E+00**				
4	**9:34:44**	960	8.62E+02	**1.12E+00**				
Spike calculator								
speed	Speed start time (Enter this value)	elapsed time (seconds)	mass at start time (mg)	Spike end time (Enter this value)	elapsed time (seconds)	mass at spike end time (mg)	**net spike mass (mg)**	**spike duration (seconds)**
1	**9:18:45**	1	1.36E-04	**9:18:58**	14	8.72E-03	**8.72E-03**	**14**
2	**9:22:48**	244	4.83E-02	**9:23:25**	281	3.14E-01	**2.65E-01**	**38**
3	**9:26:53**	489	4.42E-01	**9:27:24**	520	8.65E-01	**4.23E-01**	**32**
4	**9:30:50**	726	1.02E+00	**9:31:22**	758	1.25E+00	**2.25E-01**	**33**
Corrected concentration calculator								
speed	spike end time	speed end time	nonspike duration (sec)	total concentr (mg/m3-sec) at spike end	total concentr (mg/m3-sec) at speed end	**corrected (non-spike) average concentration (mg/m3)**		
1	9:18:58	9:22:48	230	5.13E+00	2.84E+01	**1.01E-01**		
2	9:23:25	9:26:53	208	1.84E+02	2.60E+02	**3.63E-01**		
3	9:27:24	9:30:50	206	5.09E+02	6.00E+02	**4.45E-01**		
4	9:31:22	9:34:44	202	7.33E+02	8.62E+02	**6.38E-01**		

Uncorrected concentration calculator								
Site 128 Erosion R3UN speed range	Speed End time (Enter this value)	elapsed time (seconds)	total concentr (mg/m3-sec) at speed end	**uncorrected average concentr (mg/m3)**				
1	**10:00:33**	244	1.72E+01	**7.06E-02**				
2	**10:04:33**	484	1.56E+02	**5.79E-01**				
3	**10:08:34**	725	7.33E+02	**2.39E+00**				
4	**10:12:29**	960	1.01E+03	**1.17E+00**				
Spike calculator								
speed	Speed start time (Enter this value)	elapsed time (seconds)	mass at start time (mg)	Spike end time (Enter this value)	elapsed time (seconds)	mass at spike end time (mg)	**net spike mass (mg)**	**spike duration (seconds)**
1	**9:56:30**	1	8.84E-05	**9:56:31**	2	2.07E-04	**2.07E-04**	**2**
2	**10:00:33**	244	2.93E-02	**10:00:59**	270	1.25E-01	**9.57E-02**	**27**
3	**10:04:33**	484	2.65E-01	**10:05:06**	517	8.67E-01	**6.02E-01**	**34**
4	**10:08:34**	725	1.25E+00	**10:08:48**	739	1.31E+00	**6.71E-02**	**15**
Corrected concentration calculator								
speed	spike end time	speed end time	nonspike duration (sec)	total concentr (mg/m3-sec) at spike end	total concentr (mg/m3-sec) at speed end	**corrected (non-spike) average concentration (mg/m3)**		
1	9:56:31	10:00:33	242	1.22E-01	1.72E+01	**7.07E-02**		
2	10:00:59	10:04:33	214	7.35E+01	1.56E+02	**3.86E-01**		
3	10:05:06	10:08:34	208	5.10E+02	7.33E+02	**1.07E+00**		
4	10:08:48	10:12:29	221	7.73E+02	1.01E+03	**1.06E+00**		

The summary table is used with Excel® LOOKUP functions to separate the spike portion from the rest of the signal, compute the spike mass (if any) and compute the corrected steady state flux after the spike has been removed. The durations of spikes were identified by inspecting plots of the 25 point running average slope and identifying the points in time where sudden slope breaks, indicating initiation or end of a spike, occurred. Recording pressure transducer data were used to verify the times at which changes in wind tunnel velocity took place. The time at which the spike started or occurred was then manually entered into the summary table and the Excel® LOOKUP function then identified the totalized PM-10 mass that corresponded to the start and end of the spike. The difference in totalized mass between start and end of the spike gives the spike mass. The spike mass is then subtracted from the totalized mass for the velocity step to give the spike-corrected (more precisely, the "spike removed") average mass, and, when divided by the DustTrak® flow volume over that time period, the average spike-corrected (spike removed, or non-spike) concentration over that interval.

Plots showing the running slopes for start and end of a spike are shown in Figures 18 and 19.

Table 18 summarizes the data extracted from Tables 16a, 16b, 17a and 17b, where it will subsequently be used in a flux calculation. An example spike correction calculation is shown below.

Table 17a shows the ambient data recorded that correspond to the erosion data recorded in Table 17b. Although there are no spikes in ambient data that result from initiation of wind stress on the soil surface, ambient data are averaged over the same two time intervals, spike and non-spike, as the erosion data. Depending on the values for the ambient average that were recorded over the spike interval, the "non-spike" ambient average may be slightly higher or lower than the uncorrected ambient average computed over the same time interval. Generally, the changes are small. For example, in Table 17a, Run 3S, speed 1, the uncorrected average is 3.50×10^{-2} mg/m^3, and the corrected average after removal of the ambient signal corresponding to the 14 second time interval of the spike, is 3.53×10^{-2} mg/m^3. This increase occurred because the ambient signal for the first 14 seconds of the erosion run was somewhat lower than the ambient signal for the rest of the erosion run. After ambient averages are computed for the identical time intervals for the observed erosion spikes, they are subtracted from the corresponding averaged erosion data.

Referring to Table 17b for site 128, stable erosion run 3, please examine Row 1 right under the heading "Site 128 Erosion R3S speed range." The first speed increment had an elapsed time of 244 seconds. The running total PM-10 concentration at the end of this interval was 2.84×10^{1} mg/m^3- seconds. Dividing the total PM-10 concentration by the elapsed time, one obtains the uncorrected average concentration = (2.84×10^{1} mg/m^3-seconds/ 244 seconds) = 1.16×10^{-1} mg/m^3. This is the value entered in row 1 in the column labeled "uncorrected average concentration (mg/m^3).

The next step is to calculate the mass of the spike associated with this velocity increment. Please refer to the portion of the Table 17b with the heading “Spike calculator”. In row 1 we observe that the spike elapsed time was found to be 14 seconds. The running total mass at the end of the interval was $8.72\text{x}10^{-3}$ mg. Since the starting mass is zero, the net spike mass for this interval is ($8.72\text{x}10^{-3}$ mg – 0 mg) = $8.72\text{x}10^{-3}$ mg.

For the 2nd, 3rd and 4th velocity increments, the calculation is slightly different. For example, for speed 2, the mass at the start of the spike was $4.83\text{x}10^{-2}$ mg, and the mass at the end of the spike was $3.14\text{x}10^{-1}$ mg. As a result, the net spike mass for speed 2 was ($3.14\text{x}10^{-1}$ mg – $4.83\text{x}10^{-2}$ mg) = $2.65\text{x}10^{-1}$ mg.

The net spike mass (mg) for each velocity increment of the erosion run was entered in another Excel® spreadsheet, fluxcalc04.xls (see an example in Table 18). Ambient PM-10 data corresponding to the same time intervals as the net spike mass erosion data for each velocity increment were also entered in the spreadsheet named fluxcalc04.xls.

For each speed range, the spike duration is (elapsed time at end of spike interval – elapsed time at start of interval + 1 second (we add 1 second because the TSI PM-10 records all start at t = 1 second, and not a t = 0 seconds, so true elapsed time has to allow for the fact that, the run has already been going on for 1 second when the TSI records its first data point). For example, for speed 2, elapsed time at the start of the spike is 244 seconds, and elapsed time at the end of the spike is 281 seconds. Total spike duration is 281-244+1 = 38 seconds. (Another way to see this would be to shift the 244 and 281 seconds back to the beginning of the time interval. This could be done by subtracting 243 seconds from each record, giving a spike start at 1 second and a spike end at 38 seconds, or a total duration of 38 seconds).

Finally, the data are manipulated to calculate the corrected (non-spike) concentration. Referring to Table 17b again, for speed range 1, we know that the total run duration was 244 seconds, and the spike occurred during the first 14 seconds, leaving a non-spike duration of 244-14=230 seconds. To get the non-spike concentration, the summed TSI concentrations at the end of the spike portion of the speed increment are subtracted from the summed TSI concentration at the end of the speed increment and divided by the elapsed time of the non-spike portion of the speed increment. The running total concentration at the end of the spike (t=9:18:58am) was 5.13 mg/m^3-second. The running total concentration at the end of the speed increment (t=9:22:48am) was 28.4 mg/m^3-second. Therefore, the corrected (non-spike) concentration for speed increment 1 was:

$$[(28.4 - 5.13)\ mg/m^3\text{-second}] / 230\ seconds = 1.01x10^{-1}\ mg/m^3$$

5.2 Flow calculation

Table 19 shows an example of the flow calculation spreadsheet. Values of ambient barometric pressure (in Hg), ambient air temperature (°F) and averaging pitot tube pressure difference (in of H_2O) were measured in the field during the wind tunnel runs and data were entered in an Excel® spreadsheet and used to calculate wind tunnel flow rate (Q). This flow is used with the net concentration values to calculate flux in Table 18.

The Dwyer model DS-200-4 flow sensor uses a modified form of the pitot tube equation to calculate volumetric flow rate. The basic pitot tube equation is: $V = [\, 2\, \Delta P / \rho\,]^{1/2}$. For the flow sensor, Dwyer provides a more complicated equation that includes pipe cross sectional area to calculate flow rate in actual and standard cubic feet per minute from a set of mixed units. The basic form used by Dwyer is: $Q = K (\pi D^2/4)\, [\, 2]^{1/2}\, [\, \Delta P / \rho\,]^{1/2}$, where K is a correction factor applied because the DS-200-4 flow sensor measures flow at several points in the cross section of the wind tunnel's velocity box, and D is the circular pipe diameter. Density, ρ, is calculated directly from ambient pressure and temperature using $\rho = (P\, MW) / (RT)$, where P is ambient pressure, MW is gas molecular weight, R is the universal gas constant in appropriate units and T is absolute temperature. After inserting the formula for r into the pitot tube equation, and applying unit conversion factors for the measurements' mixed units, one obtains:

$$Q(scfm) = 128.8 K D^2 \sqrt{\frac{P(\Delta P)}{T S_g}}$$

where:

Q = tunnel volumetric flow rate in the velocity measuring section in standard cubic feet per minute (scfm)

128.8 = mixed unit conversion factor

K = manufacturer-supplied constant for 4 inch Dwyer flow sensor:

D = pipe diameter in inches

P = measured static line pressure in absolute pounds per square inch

ΔP = pressure drop (inches of H_20) measured by flow sensor

T = ambient air temperature in degrees Rankine (ºR)

S_g = ambient air specific gravity relative to standard air at 1 atmosphere and 60 ºF (or 520 ºR)

The tunnel flow rate is next converted to actual cubic feet per minute using the following formula, which is a variation on the ideal gas law relationship ($P_1V_1 / T_1 = P_2V_2 / T_2$)

$$Q(acfm) = Q(scfm)\left(\frac{P_{s\tan dard}}{P_{actual}}\right)\left(\frac{T_{actual}}{T_{s\tan dard}}\right)$$

where

Q(acfm) = actual tunnel volumetric flow rate at ambient conditions

Q (scfm) = tunnel volumetric flow rate in standard cubic feet per minute computed from equation 1 above

Pstandard = Standard atmospheric pressure at 1 atmosphere, 14.7 psi

Pactual = Ambient atmospheric pressure measured at field site, in psi

Tactual = Ambient air temperature at field site at time of run, in ºR

Tstandard = Standard air temperature, as 520 ºR (60 ºF)

Tunnel volumetric flow rates are computed for each run in the “flowcalc” spreadsheet of the Excel® workbook (fluxcalc04.xls). An example of the flowcalc data for site 128, runs 3S and 3U are shown below in Table 19.

Data from the “flowcalc” spreadsheet are used in the “fluxcalc04” worksheet to calculate wind tunnel PM-10 mass flux.

5.3 Flux and spike mass calculation procedures

The corrected (non-spike) average concentration (mg/m^3) for each velocity increment of the erosion run (Table 17b) was entered in another Excel® spreadsheet, fluxcalc04.xls (see an example in Table 18). Ambient PM-10 data corresponding to the same time intervals as the spike-corrected erosion data for each velocity increment were also entered in fluxcalc04.xls. Data fields in fluxcalc04.xls were then manipulated using Excel® functions to:

1) subtract ambient PM-10 data from erosion PM-10 data to obtain the net PM-10 concentration, and then;
2) combine the net PM-10 concentration with tunnel flow data and tunnel floor area to calculate net PM-10 flux in ton/acre/hour for each run;
3) PM-10 fluxes for lower velocity increments were added to PM-10 fluxes for higher velocity increments to compute cumulative fluxes. The rationale for this addition is that, for sites with limited reservoirs of erodible particles, any mass that was emitted at a lower speed would also have come off the surface at a higher speed, and so should be included in the eroded mass at the higher speed. [This rationale, while convenient, is not quite correct, as the rate of deflation of a surface at the higher wind speed might initially be greater than the lower velocity’s flux, because of a higher bombardment rate by erodible particles. For long duration runs, the rate of deflation at long times could be lower at a higher wind speed if the surface supply of erodible particles has been depleted].

An example of a spike mass calculation, using data from Table 18 is shown below.

1) For Spike Mass - referring to Table 17b for site 128 run 3 stable, speed 1, in “spike calculator”, the net spike mass was found to be 8.72 x 10^{-3} mg (row 1 right under “net spike mass”). This is the value entered in the “individual PM-10 erosion net spike mass” column in Table 18. The difference in spike mass was calculated by subtracting the PM-10 ambient net spike mass from PM-10 erosion net spike mass [0.0087 mg - 0.0007 mg = 0.0080 mg]. The result of this

calculation was entered in Table 18 under the column labeled as “Individual PM-10 net spike mass (mg).”

2) For PM-10 concentration - again referring to Table 17b erosion for site 128 run 3 stable, speed 1 under corrected concentration calculator, row 1, the corrected (non-spike) average concentration was calculated to be 1.01 x 10^{-1} mg/m^3. We entered this value in the “spike corrected TSI Avg. erosion conc. (mg/m^3)” column, Table 18. The corresponding corrected ambient concentration, obtained from Table 17a ambient, run 3 stable, speed 1, 0.035 mg/m^3, was entered in the “average TSI Ambient concentration column” Table 18. Next, the difference in concentration was calculated by subtracting the average TSI ambient concentration from average spike corrected TSI erosion concentration [0.101 mg/ m^3 - 0.035 mg/ m^3 = 0.066 mg/ m^3]. The result of this calculation was entered in Table 18 under the column labeled “concentration difference”.

3) Flux calculation - next, the PM-10 flux was calculated by multiplying the total tunnel flow rate in ft^3/min (472.68 ft^3/min + 40 ft^3/min for the cyclone) in the column Q (ACFM) by the concentration difference (0.066 mg/m^3) in the column labeled “concentration difference (mg/m^3) and dividing by the tunnel floor area (2.5 ft^2) in the column labeled “Tunnel floor area (ft^2). The result of this calculation is an individual flux of: (512.68 ft^3/min) x (0.066 mg/m^3) / 2.50 ft2 = 13.5 (mg-ft)/(m^3-min).

This individual flux for site 128, run 3aS is added to the flux calculated during the profiling run, 14.2 (mg-ft)/ (m^3-min) to give a cumulative flux of 14.2 + 13.5 = 27.7 (mg-ft)/(m^3-min).

Units of (mg-ft)/(m^3-min) are not convenient, so the next step is to convert the flux to a more convenient set of units. The conversion works as follows:
Units of (mg-ft)/(m^3-min) are multiplied by 0.305 meter/ft and by 60 min/hour to give a flux in mg/m2-hour. For our problem 27.7 (mg-ft)/ (m^3-min) x 0.305 meter/ft x 60 min/hour = 507 mg/(m^2-hour)

Next the units are converted to ton per acre per hour by the following conversions:
507 mg/(m^2-hour) x 1 lbm/454,000 mg x 1 ton/2000 lbm x 4046 m^2/ acre = 2.26x10^{-3} ton/acre/hour.

The final value of the cumulative PM-10 flux, equal to 2.26 x 10^{-3} ton/acre/hour, is tabulated in the column Cumulative PM-10 flux (ton/acre-hour) in Table 18.

Table 18 – Example of flux calculations spreadsheet. Concentrations are for DustTrak® measured PM-10.

Site	Run	U10 (mph)	spike-corrected TSI Avg erosion conc. (mg/m^3)	Avg Tsi Ambient Conc. (mg/m3)	concentration difference (mg/m3)	Q (ACFM)	Tunnel floor area (ft2)	Individual PM 10 Flux (mg-ft)/(m3-min)	Cumulative PM 10 Flux (mg-ft)/(m3-min)	Cumulative PM 10 Flux ton/(acre-hr)	Individual PM 10 erosion net spike mass (mg)	Individual PM 10 ambient net spike mass (mg)	Individual PM 10 net spike mass (mg)	Normalized PM-10 spike in mg/m2 = [net spike mass/ (tunnel floor area x 10.76 ft2/m2)	Normalized PM 10 spike (ton/acre) = spike (mg/m2) x 4.80x10-5 (ton/acre)/(mg /m2)
WT128	3pS	13.4	0.147	0.078	0.069	472.68	2.5	1.42E+01	1.42E+01	1.16E-03	0.0173	0.0110	0.0063	0.0270	1.21E-07
WT128	3aS	15.0	0.101	0.035	0.066	472.68	2.5	1.35E+01	2.77E+01	2.26E-03	0.0087	0.0007	0.0080	0.0345	1.54E-07
WT128	3bS	25.0	0.363	0.040	0.322	472.68	2.5	6.61E+01	9.38E+01	7.65E-03	0.2653	0.0021	0.2632	1.1333	5.05E-06
WT128	3cS	35.0	0.445	0.057	0.388	472.68	2.5	7.95E+01	1.73E+02	1.41E-02	0.4229	0.0023	0.4206	1.8111	8.07E-06
WT128	3dS	39.9	0.638	0.068	0.569	472.68	2.5	1.17E+02	2.90E+02	2.36E-02	0.2248	0.0161	0.2087	0.8988	4.01E-06
WT128	3pU	15.1	0.257	0.091	0.166	474.45	2.5	3.42E+01	3.42E+01	2.79E-03	0.0487	0.0089	0.0399	0.1716	7.65E-07
WT128	3aU	15.1	0.071	0.133	0.000	474.45	2.5	0.00E+00	3.42E+01	2.79E-03	0.0002	0.0003	0.0000	0.0000	0.00E+00
WT128	3bU	25.0	0.386	0.087	0.299	474.45	2.5	6.15E+01	9.57E+01	7.80E-03	0.0957	0.0048	0.0909	0.3914	1.74E-06
WT128	3cU	35.0	1.072	0.054	1.018	474.45	2.5	2.09E+02	3.05E+02	2.49E-02	0.6018	0.0051	0.5966	2.5690	1.14E-05
WT128	3dU	38.1	1.062	0.051	1.010	505.93	2.5	2.21E+02	5.26E+02	4.29E-02	0.0671	0.0016	0.0655	0.2820	1.26E-06

Table 19 – Example of flow calculations spreadsheet

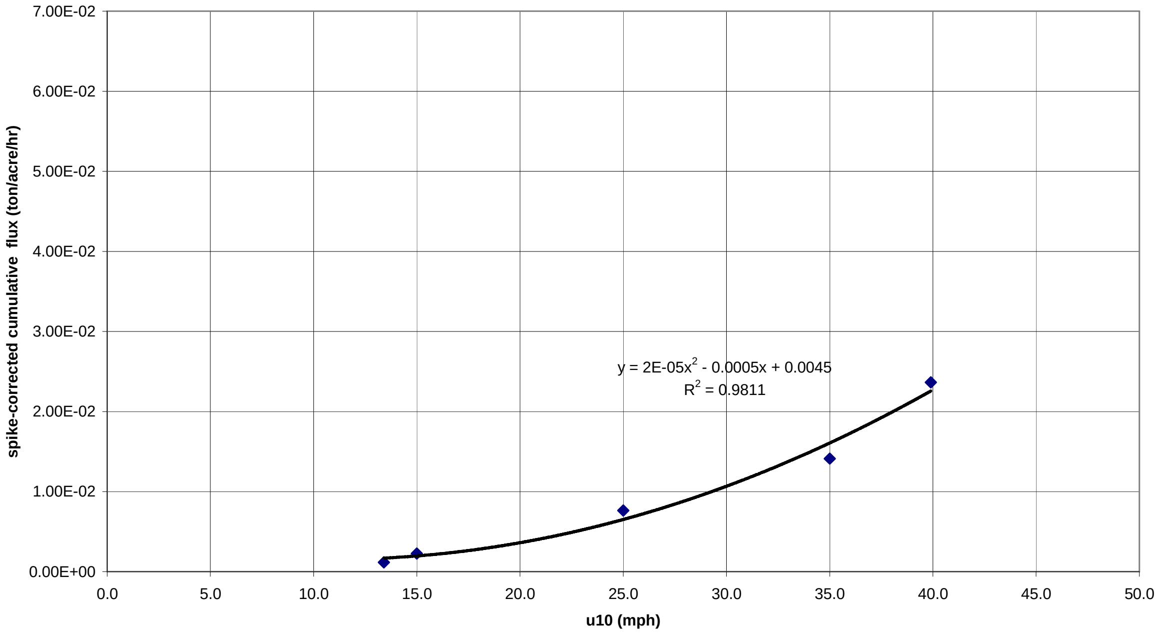
Site	Run	Barometric P (inHg)	static line pressure (psia)	Temp. (F)	Temp. (R)	Air density (lbm/ft3)	std air density lbm/ft3	Air Specific gravity rel to air at 60'	Avg. Pitot (in. H2O) deltaP	Isokinetic Error % = 100% x (avg pitot - 3.2) / 3.2	numerator = (static line P) x (averaging pitot deltaP)	denominator = (Temp in R) x (air specific gravity)	Q (SCFM) = 128.8 x 0.67 x 16 in2 x sqrt [numerator / denominator]	P Ratio (standard atmospheric P) / (static line P)	T Ratio (actual temp in R) / (standard temp in R)	Tunnel flow Q (ACFM) = Q(SCFM) x Pratio x Tratio
WT128	3pS	27.64	13.571	87.8	547.8	0.067	0.076	8.79E-01	3.20	0.00%	43.43	481.56	414.21	1.083	1.053	472.68
WT128	3aS	27.64	13.571	87.8	547.8	0.067	0.076	8.79E-01	3.20	0.00%	43.43	481.56	414.21	1.083	1.053	472.68
WT128	3bS	27.64	13.571	87.8	547.8	0.067	0.076	8.79E-01	3.20	0.00%	43.43	481.56	414.21	1.083	1.053	472.68
WT128	3cS	27.64	13.571	87.8	547.8	0.067	0.076	8.79E-01	3.20	0.00%	43.43	481.56	414.21	1.083	1.053	472.68
WT128	3dS	27.64	13.571	87.8	547.8	0.067	0.076	8.79E-01	3.20	0.00%	43.43	481.56	414.21	1.083	1.053	472.68
WT128	3pU	27.67	13.585	89.6	549.6	0.067	0.076	8.77E-01	3.21	0.31%	43.61	482.08	414.86	1.082	1.057	474.45
WT128	3aU	27.67	13.585	89.6	549.6	0.067	0.076	8.77E-01	3.21	0.31%	43.61	482.08	414.86	1.082	1.057	474.45
WT128	3bU	27.67	13.585	89.6	549.6	0.067	0.076	8.77E-01	3.21	0.31%	43.61	482.08	414.86	1.082	1.057	474.45
WT128	3cU	27.67	13.585	89.6	549.6	0.067	0.076	8.77E-01	3.21	0.31%	43.61	482.08	414.86	1.082	1.057	474.45
WT128	3dU	27.67	13.585	89.6	549.6	0.067	0.076	8.77E-01	3.65	14.06%	49.59	482.08	442.38	1.082	1.057	505.93

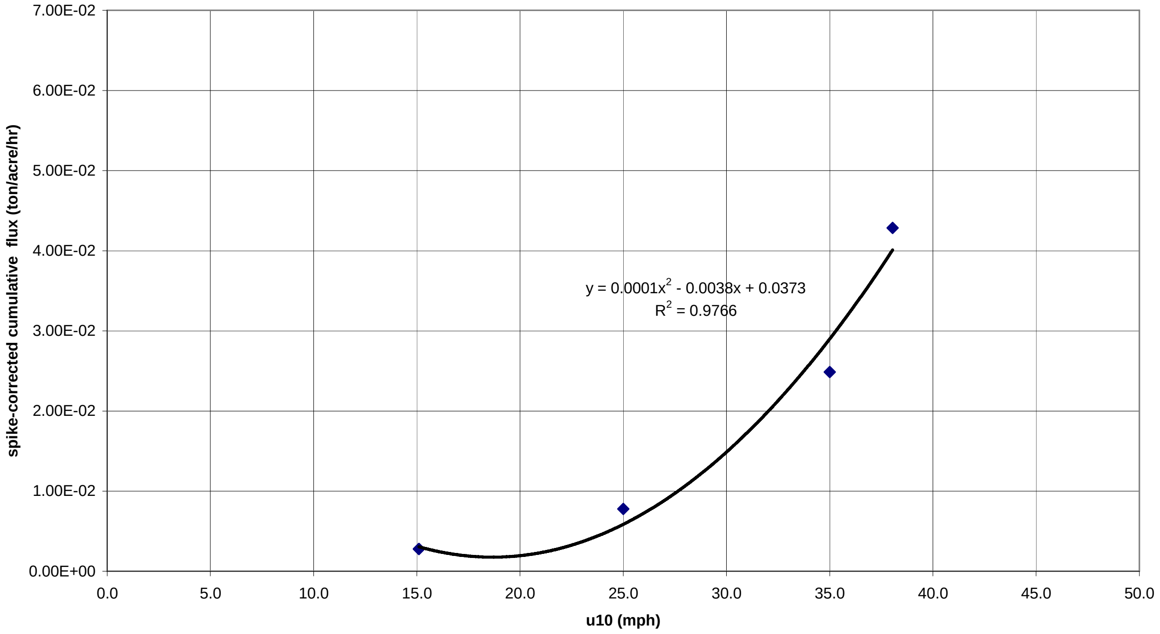
5.4 Calculation of cumulative fluxes and flux plots

Graphs were then created for cumulative flux versus 10-meter velocity for every wind tunnel run. For example, Figure 20 shows the cumulative flux versus 10-meter velocity, for site 128, run 3S and run 3U. Wind erosion results reported in the scientific literature generally predict quadratic (vertical flux) or cubic (horizontal flux) relationships of particulate flux to friction velocity, commonly designated as u*. For velocity profiles that generally fit the expected logarithmic relationship of velocity to height, $\{ u(z) = [u^{*}/ k] [\log_e (z/zo)] \}$, power-law fits to velocity at 10 meters will be re-scaled versions of the power law fits to u*, since velocity at 10 meters, u(10), can be represented as the friction velocity, u*, multiplied by a constant that corresponds to $\{ [1 / k] [\ln(10/zo)] \}$, where zo is the aerodynamic roughness height in meters and k is the von Karman constant, typically reported to be $k = 0.40$.

Graphs of cumulative flux vs 10-meter velocity were plotted and inspected for internal consistency of data for each wind tunnel run to see if they conformed to the quadratic or cubic trends of cumulative flux vs (u*) or 10-meter velocity previously reported in the literature. Typical plots, as shown below in Figure 20 with quadratic fits to the data, show non-linear increases in cumulative flux vs wind speed.

Figure 20 – Example of U10 versus spike corrected flux – WT128 3S and 3U


WT 128 run 3 stable cumulative flux


WT 128 run 3 unstable cumulative flux

The process of developing cumulative fluxes for each velocity segment of each run was repeated for all wind tunnel runs for which UNLV had obtained valid data. This amounts to 192 runs (96 stable, 96 unstable) for 32 sites, and 4 velocity increments per run, plus the profiling velocity, for a total of 911 valid records out of a possible 960.

Table 20 summarizes problematic runs and discarded data. It includes information about the sites and runs for which (960-911) = 49 flux records are not available during the WT 2004 field experiments. It also provides information about runs for which modified data were used (example, replacing locally missing ambient PM-10 data with DAQEM web page data).

All 911 valid flux records were entered into a Microsoft Excel® master flux table similar to that shown in Table 18. The Excel® flux master data table was then exported to a Microsoft Access® database file. Queries were created to select fluxes in five mile per hour wind speed bands for each wind erodibility group and stability condition. Geometric averages and standard deviations for each wind erodibility group, wind speed range, and soil stability condition were calculated using a set of nested Access® queries that classified flux data from different runs and sites into 5 mph wind bands for each Wind Erodibility Group (WEG), $\log_e$-transformed the flux data, performed statistical calculations to generate means and standard deviations, and then back-transformed the $\log_e$-flux means and standard deviations back to plain flux values.

Log_e-transformations of the data were performed because distributions of the flux data at each Wind Erodibility Group and stability class showed right skew. "Right skew" means that flux distributions were characterized by a few large positive values, and not by any corresponding large negative values. The few large positive values are occasional measurements of very high flux rates. Log_e-transforms of this type of data distribution are performed to carry out normal distribution statistics (mean, standard deviation) with the transformed data. This is also called *stabilizing the variance*. The back-transformed result will have an asymmetric standard deviation that represents the existence of right-skew in the original data.

Table 20 – Summary of problematic runs and discarded data

Site Number	Run	Problem	Solution
WT111, WT113, WT115, WT118, WT122, WT126, WT127, WT131, WT133, WT134, WT135, WT 142	All Ambient-Profile runs	Data was not collected	For First Run Prof-Amb concentr was estimated as average of runs **a** through **d.** For other runs Prof-Amb conc. was estimated as weighted average. Mass was estimated using average value
WT116	3U	Field profile data was not good	Data was not used
WT118	1cS, 1dS	Run short cut (559 Sec)	Data was not used
WT122	1dS	Run with 23 sec duration	Data was not used
WT124	2aU, 2bU, 2cU, 2dU	Erosion data was not good	Data was not used
WT132	All	Ambient data was lost while downloading	We used the DAQEM webpage average PM-10 emisssion for the day
WT140	3aS	Ambient run was recorded only for 5 min	For speeds 2, 3, 4 we are using the data from ambient run 3UN masses
WT145	All	Owner asked WT team to leave the site	Data was not used

For example, after back transforming the data for Wind Erodibility Group 3, stable and unstable, wind band 15-20 mph, the result is the following (Table 21):

<u>For stable site</u>:

Mean flux – 1 standard deviation: 5.80 x 10^{-4} ton/acre/hr

Mean flux: 1.32 x 10^{-3} ton/acre/hr

Mean flux + 1 standard deviation: 3.01 x 10^{-3} ton/acre/hr

<u>For unstable site:</u>

Mean flux – 1 standard deviation: 5.58 x 10^{-4} ton/acre/hr

Mean flux: 1.31 x 10^{-3} ton/acre/hr

Mean flux + 1 standard deviation: 3.09 x 10^{-3} ton/acre/hr

In both of the above cases, note how the value of the mean – 1 standard deviation is about 0.75 x 10^{-3} ton/acre/hour below the mean value, and the value of the mean + 1 standard deviation is about 1.70 x 10^{-3} ton/acre/hour above the mean. The 84th%ile (mean + 1 standard deviation) values are much farther from the mean than the 16th%ile (mean – 1 standard deviation) values because of skew in the data sets.

After calculating the back-transformed geometric means and standard deviations for each wind band, the results were classified by Wind Erodibility Group (WEG) and organized by WEG into look-up tables for stable and unstable soil surfaces. Example look-up tables are shown below for WEG 3 in Table 21.

Table 21 – Summary for WEG 3 stable and unstable – flux data

WEG 3 Stable				
wind band (mph)	**geo mean - 1 std.dev flux, ton/acre/hr**	**geo mean flux ton/acre/hr**	**geo mean + 1 std.dev flux, ton/acre/hr**	**sample size, n =**
10-15	6.27E-04	1.87E-03	5.59E-03	16
15-20	5.80E-04	1.32E-03	3.01E-03	14
20-25	5.78E-04	2.46E-03	1.05E-02	19
25-30				
30-35	1.88E-03	7.08E-03	2.67E-02	22
35-40	1.52E-03	6.57E-03	2.84E-02	5
40-45	3.30E-03	6.26E-03	1.19E-02	9
45-50				

WEG 3 Unstable				
wind band (mph)	**geo mean - 1 std.dev flux (ton/acre/hr)**	**geo mean flux (ton/acre/hr)**	**geo mean + 1 std.dev flux (ton/acre/hr)**	**sample size n=**
10-15	7.71E-04	1.94E-03	4.87E-03	10
15-20	5.58E-04	1.31E-03	3.09E-03	23
20-25	1.34E-03	3.15E-03	7.41E-03	20
25-30				
30-35	4.69E-03	1.11E-02	2.62E-02	19
35-40	7.63E-03	2.21E-02	6.40E-02	4
40-45	8.93E-03	2.44E-02	6.69E-02	13
45-50				

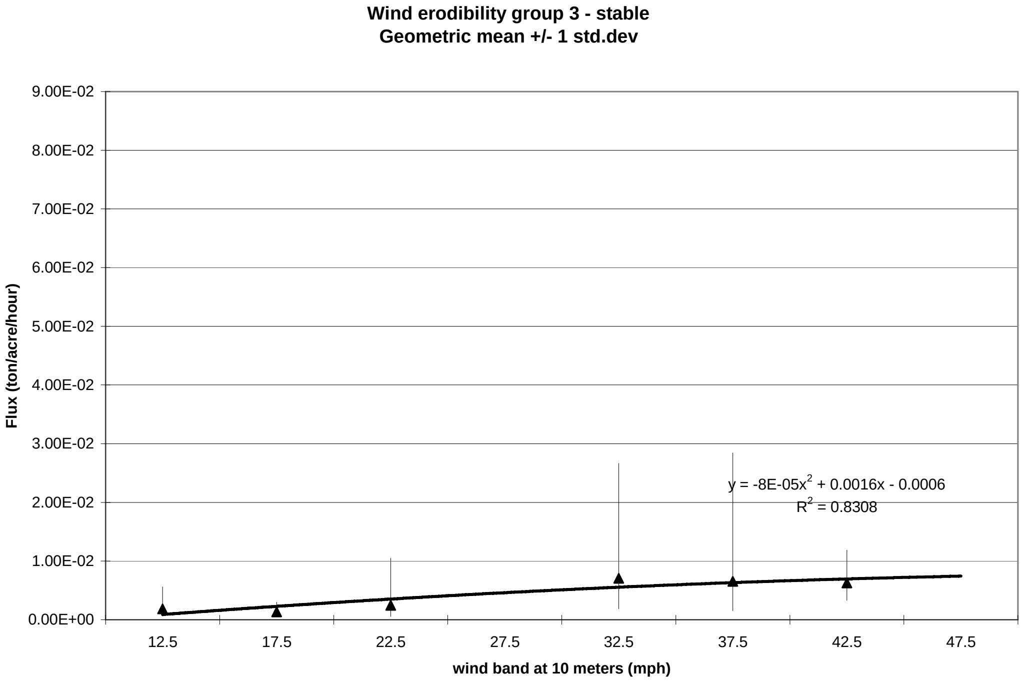
Geometric mean and standard deviation data from the look-up tables are then plotted to illustrate general trends in the geometric mean flux data. Example plots are shown in Figure 21. Each data point in Figure 21 shows the asymmetric distribution of values about the mean for the geometric averages computed over all sites and all runs.

Figure 21 also includes general quadratic fits of the averaged flux on wind speed band. Although correlations of mean values on wind speed band are fairly good, they are usually weaker than correlations computed for individual sites. This can be expected because the results have been computed for all data from different sites and runs that correspond to a particular WEG, and therefore represent spatially heterogeneous results from different locations in the Las Vegas Valley.

Log-transformed versions of the plots were generated in order to better visualize fluxes at both the low and high ends of the range. Examples are shown for WEG 3 in Figure 22.

These plots make it easier to visualize the variability at both the low and high ends of the data range in one figure.

Figure 21 – Example flux data plots of geometric means WEG 3 – stable and unstable showing asymmetric standard deviations and general trends



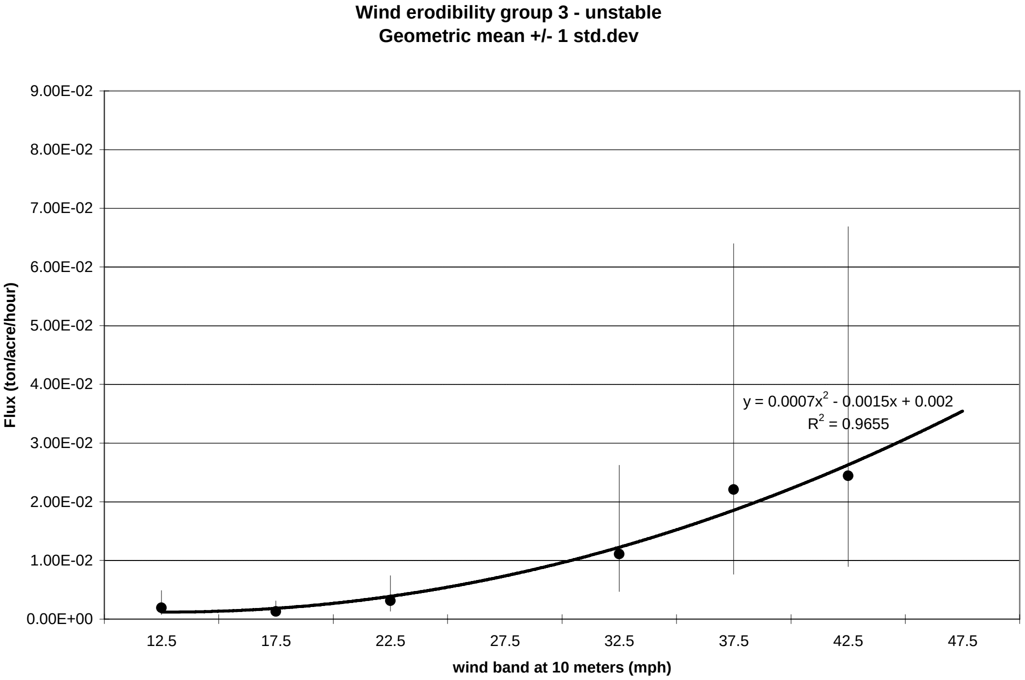
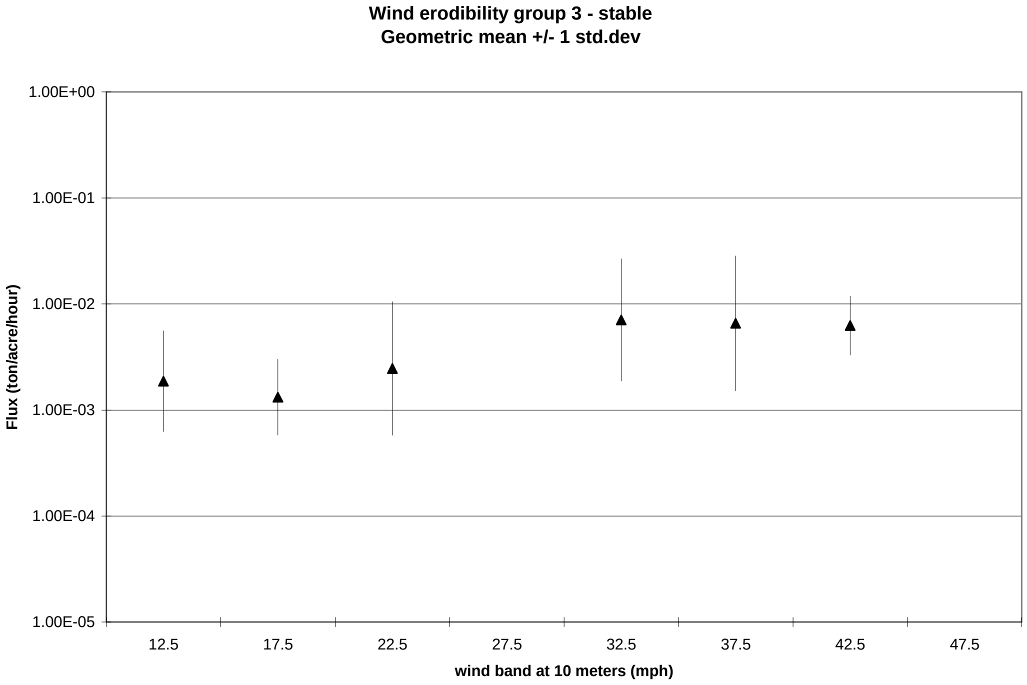
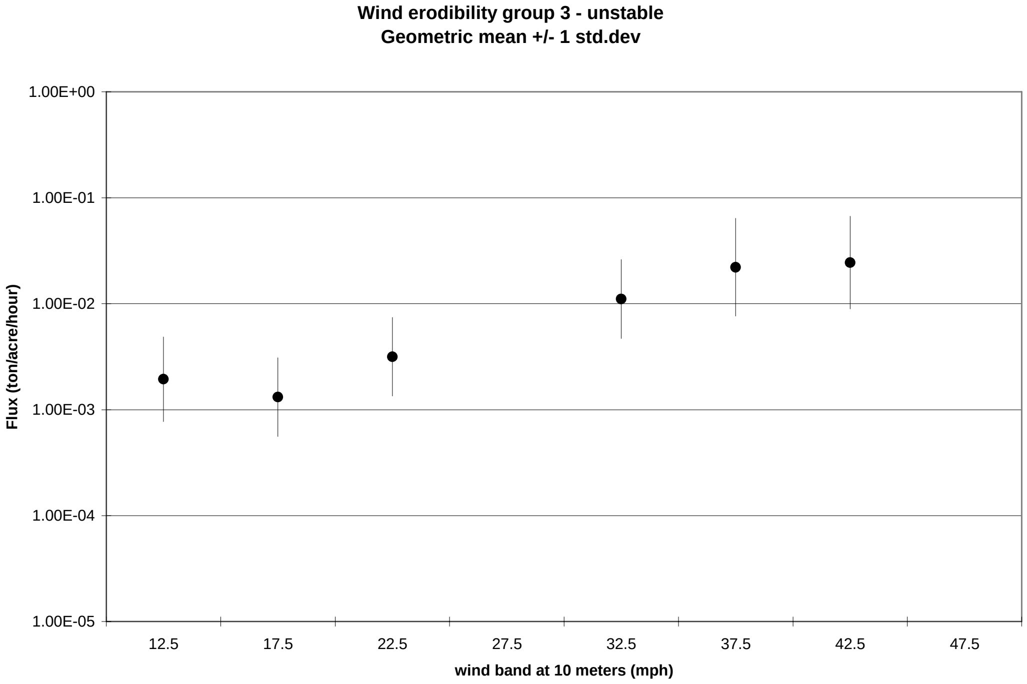


Figure 22 – Example $\log_{10}$ scale data plots of geometric means WEG 3 – stable and unstable





A second set of Access® queries were created that performed the $\log_e$ transformations, classification in five mile per hour wind speed bands, and performed statistical calculations on stable or unstable flux data that were combined for all Wind Erodibility Groups. These data are shown in the Chapter 6, Results.

5.5 How geometric mean spike data were created from the database

Statistical treatment of individual spike data was performed in a similar matter to the flux data. Spike data were exported from Excel® to Access® in the same database as the flux data. Queries were created to select spikes in five mile per hour wind speed bands for each wind erodibility group and stability condition. Geometric averages and standard deviations for individual spike masses in each wind erodibility group, wind speed range, and soil stability condition were calculated using a set of nested Access® queries that classified the spike data from different runs and sites into 5 mph wind bands for each Wind Erodibility Group (WEG), $\log_e$-transformed the spike data, performed statistical calculations to generate means and standard deviations, and then back-transformed the $\log_e$-spike means and standard deviations back to plain spike masses in ton/acre.

Log_e-transformations of the spike data were performed because distributions of the spike values at each Wind Erodibility Group and stability class showed right skew. The $\log_e$ transformation stabilizes variances in a manner similar to the flux data.

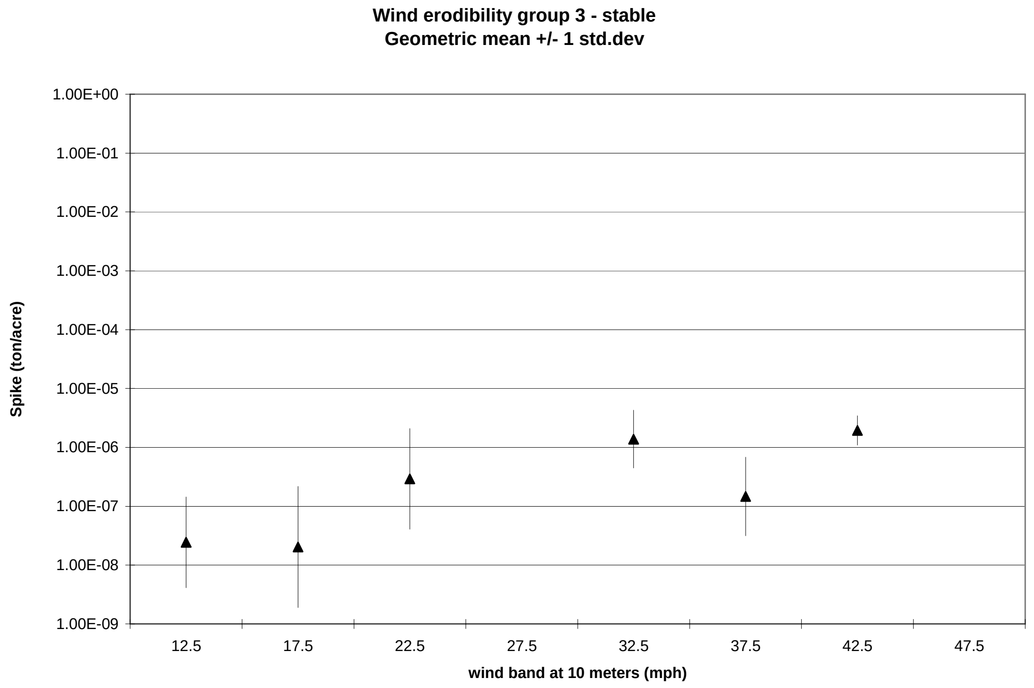
An example spike data set for Wind Erodibility Group 3 is shown in Table 22 for both the stable and unstable conditions. Data in Table 22 are plotted in Figure 23.

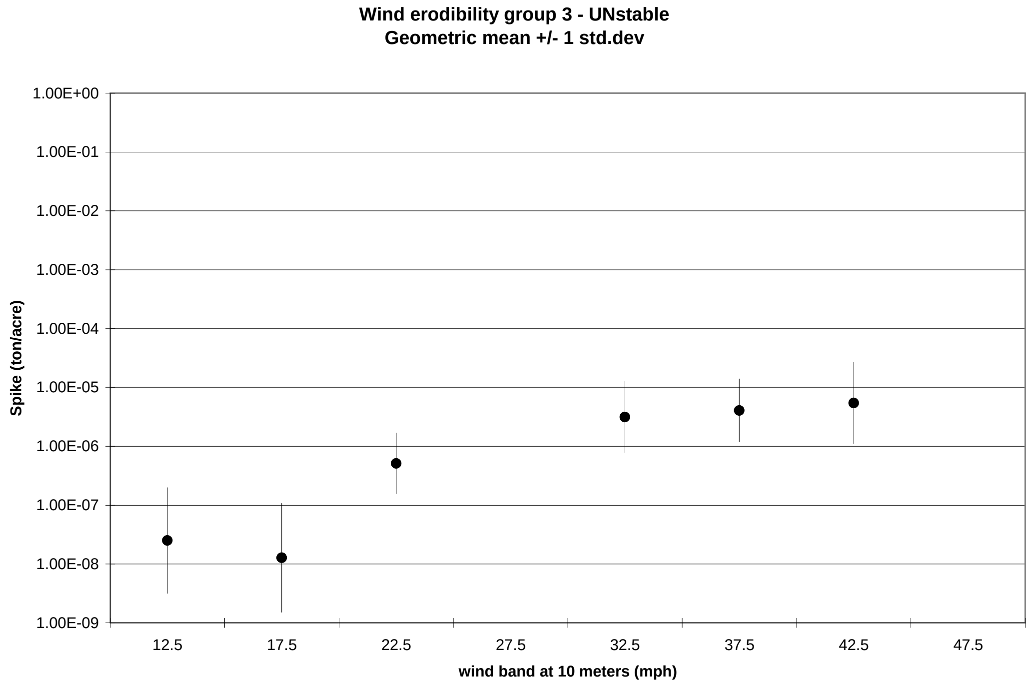
Table 22 – Summary for WEG 3 stable and unstable – spike data

WEG 3 Stable - Spike				
wind band (mph)	geo mean - 1 std.dev spike, ton/acre	geo mean spike ton/acre	geo mean + 1 std.dev spike, ton/acre	sample size, n=
10-15	4.12E-09	2.44E-08	1.44E-07	14
15-20	1.90E-09	2.04E-08	2.18E-07	15
20-25	4.06E-08	2.91E-07	2.09E-06	19
25-30				
30-35	4.45E-07	1.38E-06	4.29E-06	22
35-40	3.15E-08	1.47E-07	6.85E-07	5
40-45	1.09E-06	1.94E-06	3.45E-06	9
45-50				

WEG 3 Unstable - Spike				
wind band (mph)	geo mean - 1 std.dev spike, ton/acre	geo mean spike ton/acre	geo mean + 1 std.dev spike, ton/acre	sample size n=
10-15	3.17E-09	2.52E-08	2.00E-07	11
15-20	1.52E-09	1.28E-08	1.07E-07	21
20-25	1.55E-07	5.12E-07	1.69E-06	20
25-30				
30-35	7.79E-07	3.15E-06	1.28E-05	19
35-40	1.18E-06	4.06E-06	1.40E-05	4
40-45	1.10E-06	5.45E-06	2.69E-05	13
45-50				

Figure 23 – Example spike data plots of geometric means WEG 3 – stable and unstable conditions, showing asymmetric standard deviations and general trends





A second set of Access® queries were created that performed the $\log_e$ transformations, classification in five mile per hour wind speed bands, performed statistical calculations on stable or unstable spike data that were combined for all Wind Erodibility Groups. These data are shown in Chapter 6, Results of Wind Tunnel Measurements.

6 - Results of wind tunnel measurements

6.1 Aerodynamic roughness, friction velocity measurement, nominal WT velocities

Results for aerodynamic roughness (z_0), friction velocity measurements (U^*) during the profiling erosion runs, nominal wind tunnel velocities set at 10 meters (U10), and the friction velocities (U*) corresponding to U10 using the measured aerodynamic roughness height are shown in Table 23, Appendix A. Data are organized by Site number and run number. The corresponding Wind Erodibility Group and site visit date are also included. In the "run" column, data are organized in a 3-digit code with the following format.

The first digit is a numeric code for run number at the site. The run number may have values ranging from 1 to 3. The second digit is an alphabetical code that describes the applied velocity during the run. There are five possible codes, **p** represents the 5-minute profiling run, usually the lowest velocity with the tunnel damper wide open; **a** represents the first progressive velocity run, usually corresponding to a duration of four minutes, at the lowest possible velocity, **b** represents the second progressive 4-minute velocity, **c** represents the third progressive 4-minute velocity, and **d** represents the fourth progressive 4-minute velocity. The third code describes the stability of the surface. **S** stands for stable and **U** stands for Unstable. For example:

1) 1pS in the table means run 1, during the profile run, stable,

2) 1aS means run 1, first progressive velocity value, during a stable run.

3) 3dU means, run 3, 4th progressive velocity, unstable run.

Most of the sites were exposed to a total erosion duration of 5+4+4+4+4=21 minutes.

6.2 Flux and spike results for individual sites

Table 24, Appendix B shows results for spike-corrected TSI erosion concentration in milligram per cubic meter, spike-corrected TSI ambient concentration in milligram per cubic meter, PM-10 concentration difference (erosion-ambient) in milligram per cubic meter, tunnel flow rate in actual cubic feet per minute (ACFM), cumulative PM-10 flux in ton per acre per hour, individual PM-10 erosion spike mass in grams, individual PM-10 ambient spike mass in grams, individual net (erosion-ambient) spike mass in grams, and net PM-10 spike mass in ton per acre.

As described in Chapter 5, wind tunnel PM-10 flux is computed from the product of the tunnel flow rate and net PM-10 concentration difference, divided by the wind tunnel floor area. Conversion factors, some of which are not shown in Table 24 (Appendix B), but contained in the numerical database, were used to convert the product of tunnel flow rate and net concentration difference into flux in ton per acre per hour. Graphs using the data in Table 24 were created for cumulative flux versus 10-meter velocity for every wind tunnel run. Plots for all sites tested in the 2004 wind tunnel experiment are shown in Appendix C, Figures 24 to 213.

6.3 Individual Wind Erodibility Group flux statistical summary results

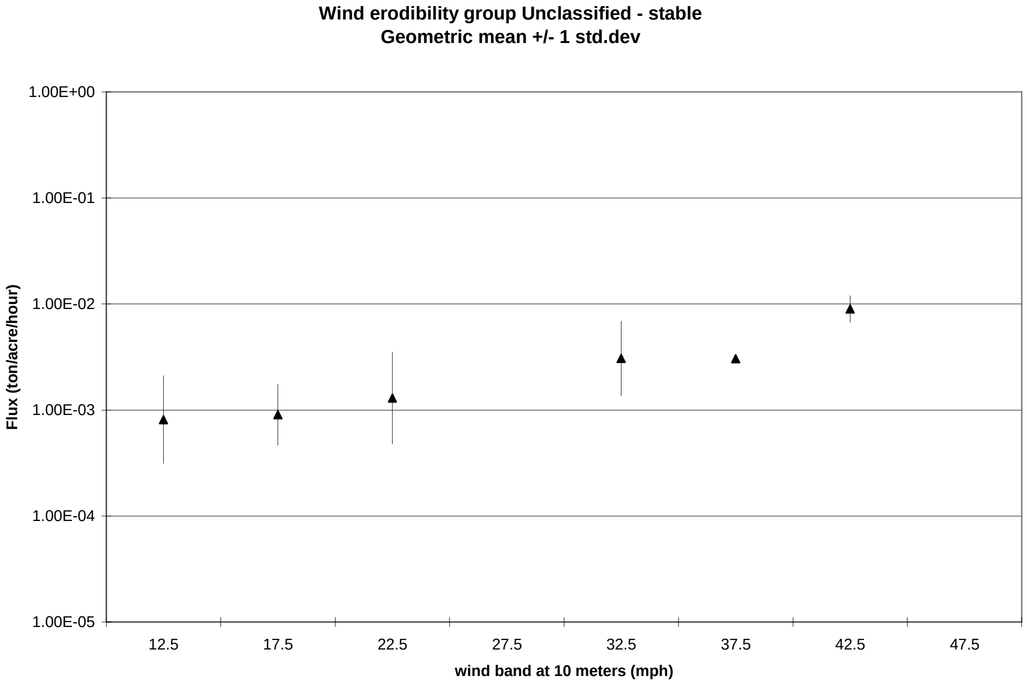
Geometric averages, standard deviations and sample size results for fluxes in five mile per hour wind speed bands, classified by Wind Erodibility Group and stability condition are shown in Tables 25 to 33 and in Figures 214 to 222.

Table 25 – Summary for WEG unclassified stable and unstable – flux data

WEG Unclassified Stable				
wind band (mph)	geo mean - 1 std.dev flux, ton/acre/hr	geo mean flux ton/acre/hr	geo mean + 1 std.dev flux, ton/acre/hr	sample size n=
10-15	3.13E-04	8.13E-04	2.11E-03	3
15-20	4.65E-04	9.01E-04	1.74E-03	2
20-25	4.77E-04	1.30E-03	3.52E-03	3
25-30				
30-35	1.37E-03	3.06E-03	6.87E-03	3
35-40		3.04E-03		1
40-45	6.72E-03	8.97E-03	1.20E-02	2
45-50				

WEG Unclassified Unstable				
wind band (mph)	geo mean - 1 std.dev flux (ton/acre/hr)	geo mean flux (ton/acre/hr)	geo mean + 1 std.dev flux (ton/acre/hr)	sample size n=
10-15	5.75E-04	9.20E-04	1.47E-03	3
15-20	8.53E-04	1.32E-03	2.04E-03	2
20-25	3.75E-03	5.43E-03	7.87E-03	3
25-30				
30-35	1.04E-02	1.65E-02	2.62E-02	4
35-40		2.33E-02		1
40-45		1.68E-02		1
45-50				

Figure 214 – Results for flux data plots of geometric means WEG UN – stable and unstable



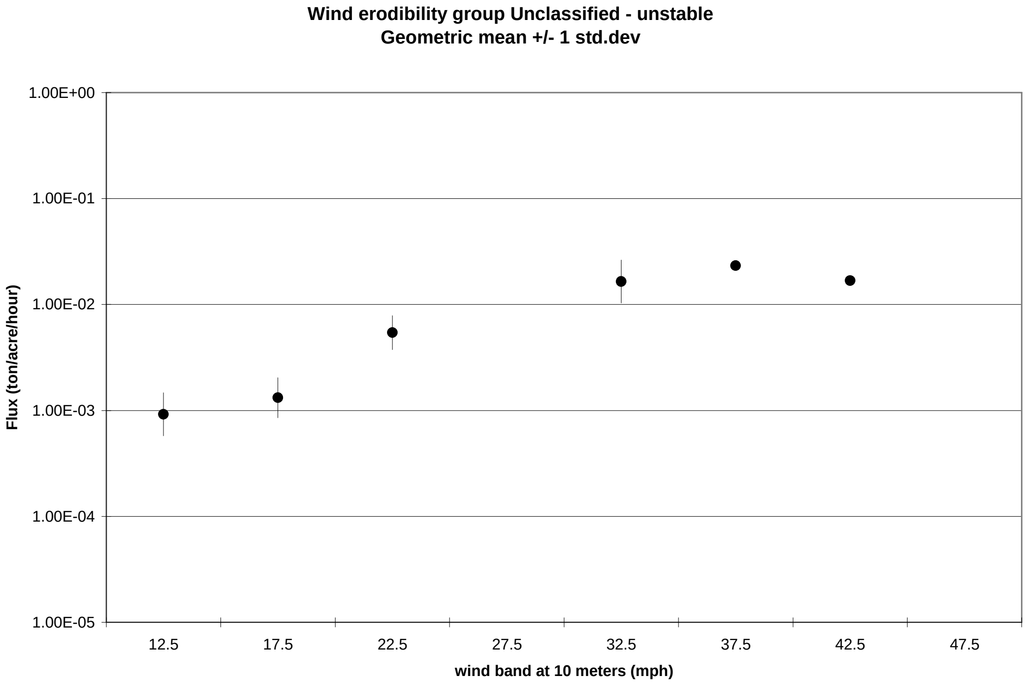
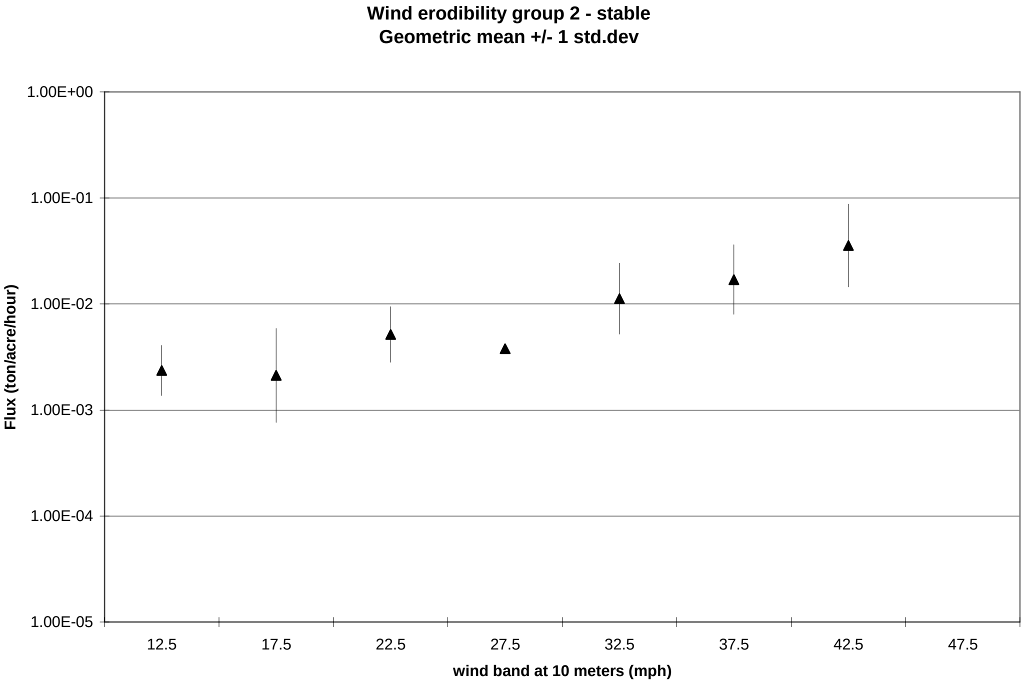


Table 26 – Summary for WEG 2 stable and unstable – flux data

WEG 2 Stable				
wind band (mph)	geo mean - 1 std.dev flux, ton/acre/hr	geo mean flux ton/acre/hr	geo mean + 1 std.dev flux, ton/acre/hr	sample size, n =
10-15	1.37E-03	2.36E-03	4.07E-03	11
15-20	7.65E-04	2.12E-03	5.88E-03	12
20-25	2.82E-03	5.16E-03	9.44E-03	11
25-30		3.79E-03		1
30-35	5.19E-03	1.12E-02	2.43E-02	15
35-40	7.97E-03	1.70E-02	3.61E-02	7
40-45	1.45E-02	3.56E-02	8.75E-02	2
45-50				

WEG 2 Unstable				
wind band (mph)	geo mean - 1 std.dev flux (ton/acre/hr)	geo mean flux (ton/acre/hr)	geo mean + 1 std.dev flux (ton/acre/hr)	sample size n=
10-15	1.54E-03	2.71E-03	4.78E-03	6
15-20	2.29E-04	1.46E-03	9.28E-03	14
20-25	1.88E-03	5.11E-03	1.39E-02	14
25-30	2.09E-02	2.50E-02	3.00E-02	2
30-35	1.04E-02	2.01E-02	3.87E-02	12
35-40	3.18E-02	4.06E-02	5.18E-02	4
40-45	2.37E-02	4.12E-02	7.17E-02	6
45-50				

Figure 215 – Results for flux data plots of geometric means WEG 2 – stable and unstable



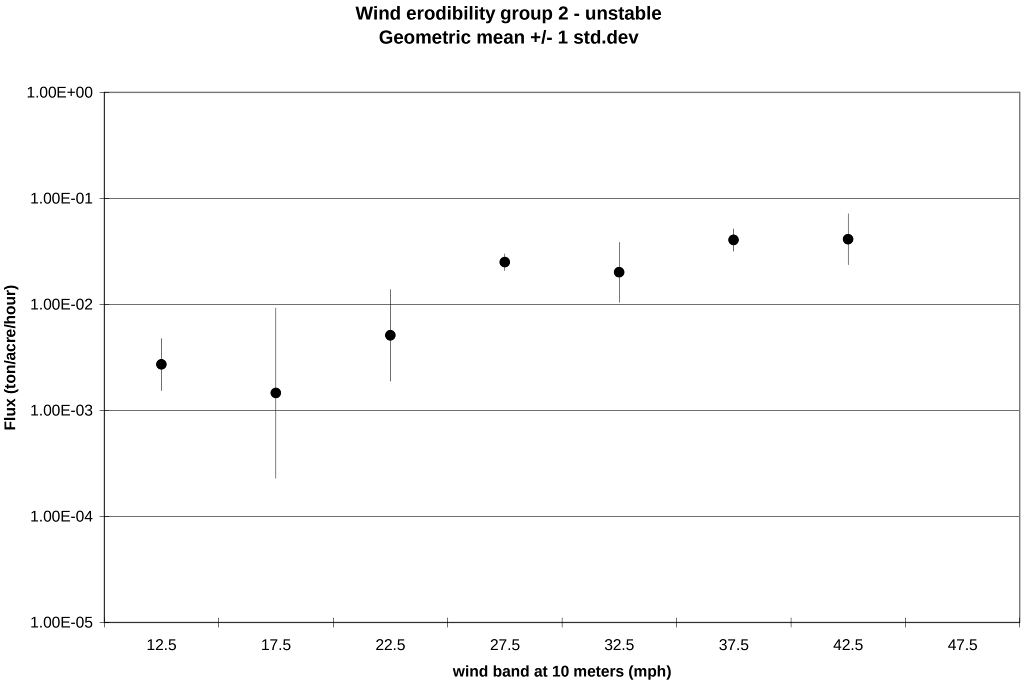
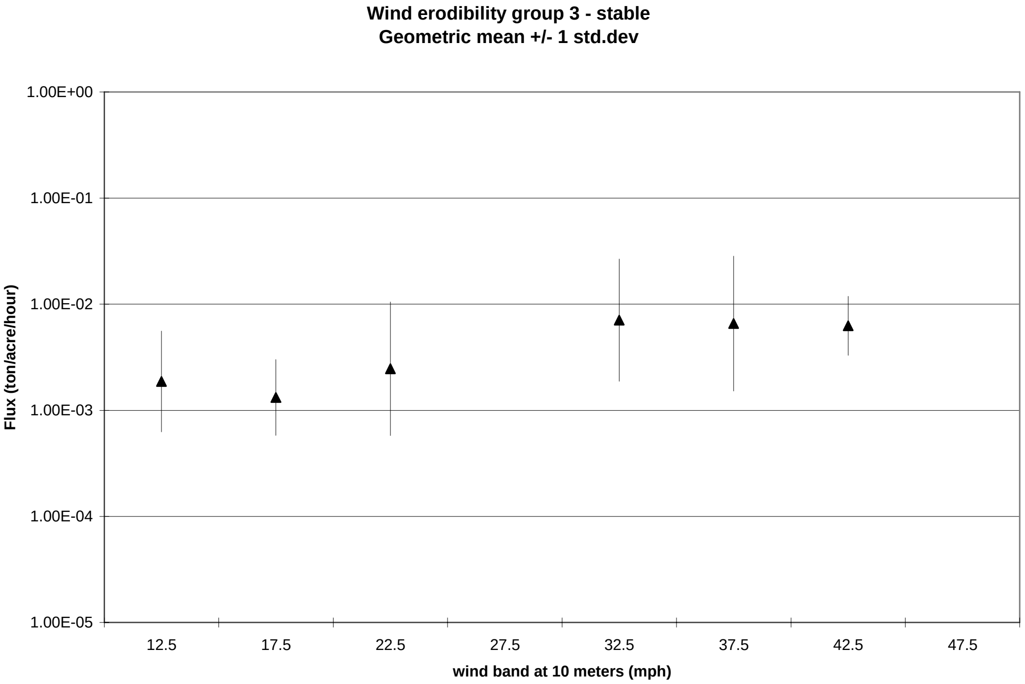


Table 27 – Summary for WEG 3 stable and unstable – flux data

WEG 3 Stable				
wind band (mph)	**geo mean - 1 std.dev flux, ton/acre/hr**	**geo mean flux ton/acre/hr**	**geo mean + 1 std.dev flux, ton/acre/hr**	**sample size, n =**
10-15	6.27E-04	1.87E-03	5.59E-03	16
15-20	5.80E-04	1.32E-03	3.01E-03	14
20-25	5.78E-04	2.46E-03	1.05E-02	19
25-30				
30-35	1.88E-03	7.08E-03	2.67E-02	22
35-40	1.52E-03	6.57E-03	2.84E-02	5
40-45	3.30E-03	6.26E-03	1.19E-02	9
45-50				

WEG 3 Unstable				
wind band (mph)	**geo mean - 1 std.dev flux (ton/acre/hr)**	**geo mean flux (ton/acre/hr)**	**geo mean + 1 std.dev flux (ton/acre/hr)**	**sample size n=**
10-15	7.71E-04	1.94E-03	4.87E-03	10
15-20	5.58E-04	1.31E-03	3.09E-03	23
20-25	1.34E-03	3.15E-03	7.41E-03	20
25-30				
30-35	4.69E-03	1.11E-02	2.62E-02	19
35-40	7.63E-03	2.21E-02	6.40E-02	4
40-45	8.93E-03	2.44E-02	6.69E-02	13
45-50				

Figure 216 – Results for flux data plots of geometric means WEG 3 – stable and unstable



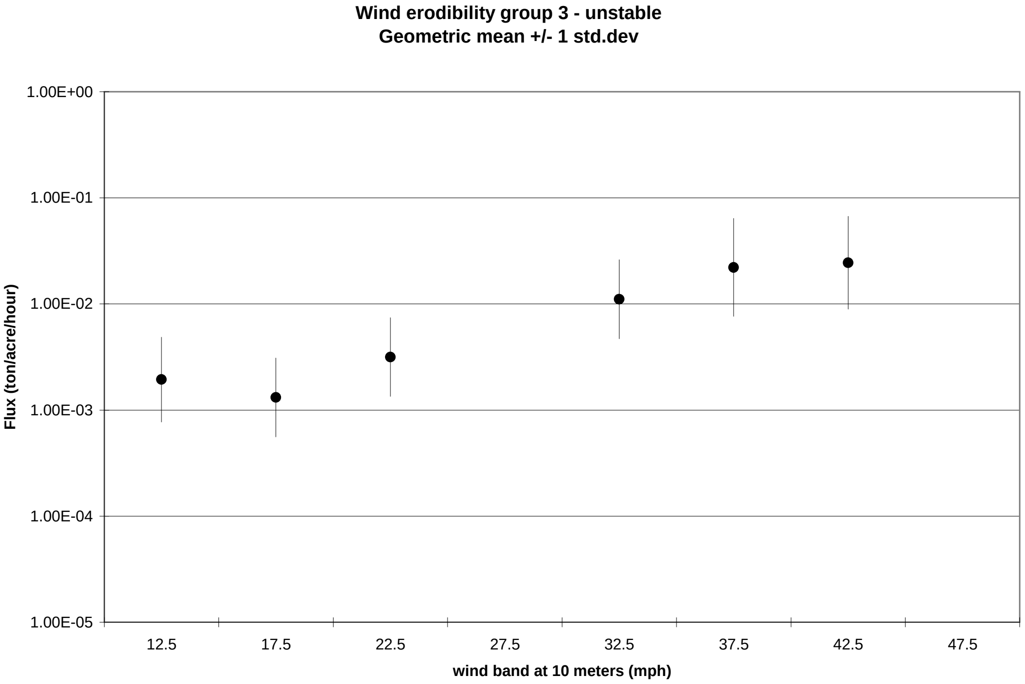
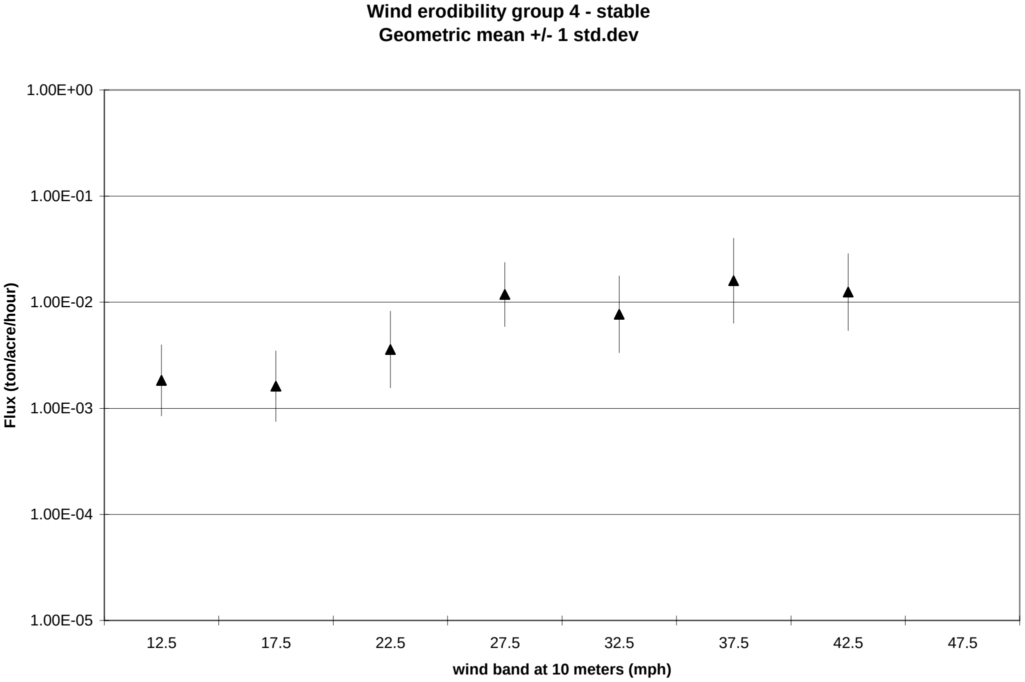


Table 28 – Summary for WEG 4 stable and unstable – flux data

WEG 4 Stable				
wind band (mph)	geo mean - 1 std.dev flux, ton/acre/hr	geo mean flux ton/acre/hr	geo mean + 1 std.dev flux, ton/acre/hr	sample size, n =
10-15	8.45E-04	1.83E-03	3.97E-03	25
15-20	7.50E-04	1.61E-03	3.48E-03	17
20-25	1.55E-03	3.57E-03	8.24E-03	24
25-30	5.89E-03	1.18E-02	2.38E-02	7
30-35	3.34E-03	7.69E-03	1.77E-02	23
35-40	6.32E-03	1.60E-02	4.02E-02	11
40-45	5.39E-03	1.25E-02	2.88E-02	7
45-50				

WEG 4 Unstable				
wind band (mph)	geo mean - 1 std.dev flux (ton/acre/hr)	geo mean flux (ton/acre/hr)	geo mean + 1 std.dev flux (ton/acre/hr)	sample size n=
10-15	3.81E-04	1.08E-03	3.07E-03	24
15-20	4.13E-04	9.91E-04	2.38E-03	22
20-25	2.29E-03	6.25E-03	1.71E-02	22
25-30	3.71E-03	1.45E-02	5.64E-02	7
30-35	1.23E-02	2.64E-02	5.66E-02	22
35-40	1.30E-02	3.12E-02	7.47E-02	13
40-45	1.95E-02	4.77E-02	1.17E-01	7
45-50				

Figure 217 – Results for flux data plots of geometric means WEG 4 – stable and unstable



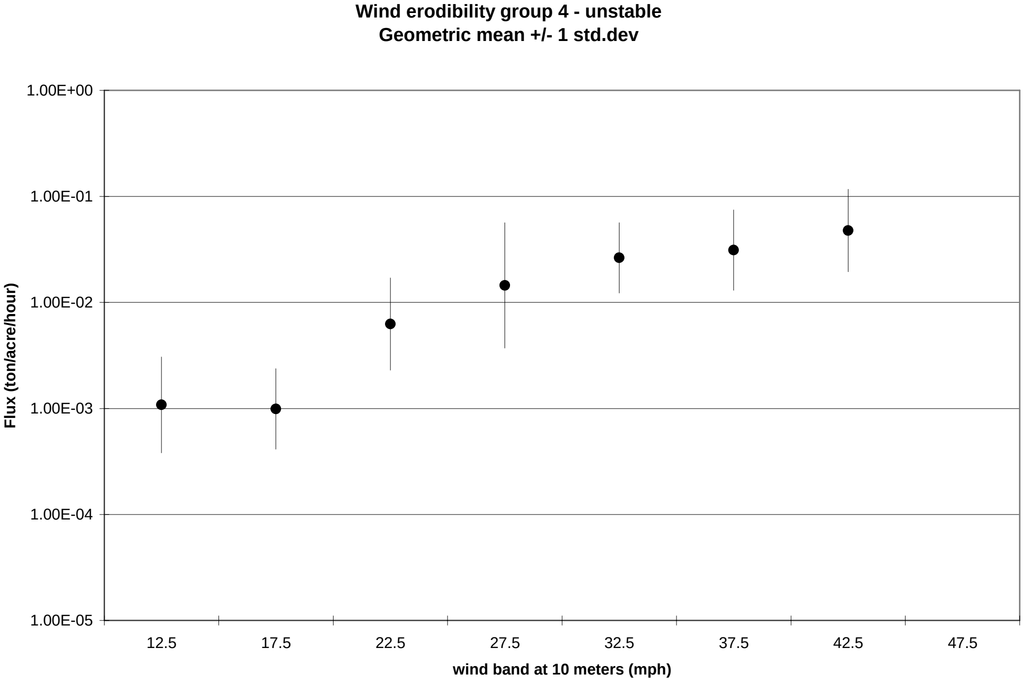
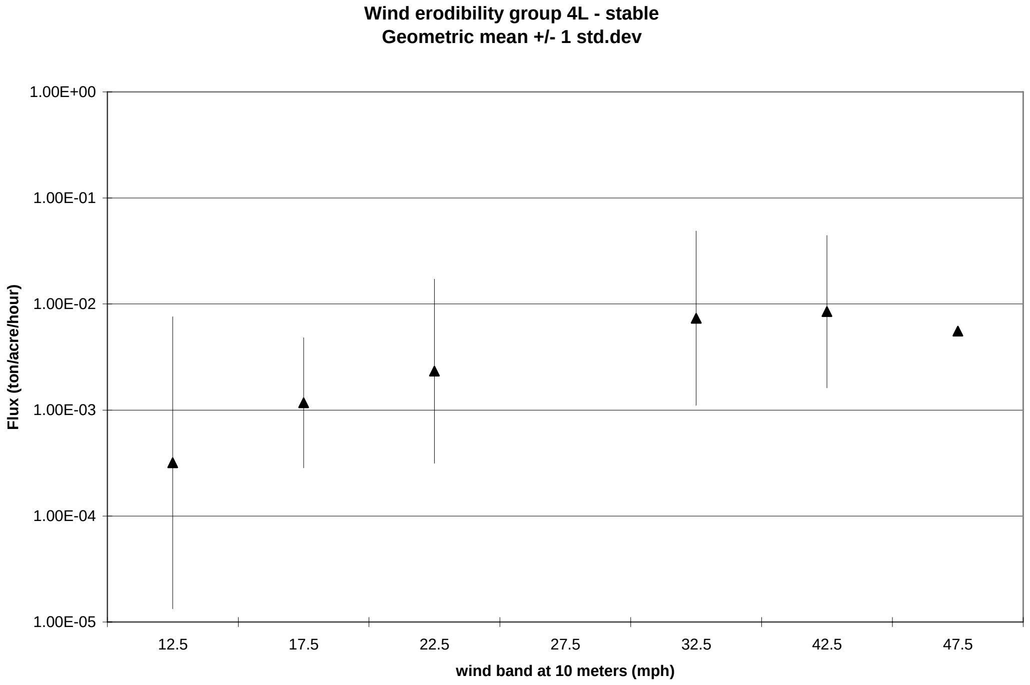


Table 29 – Summary for WEG 4L stable and unstable – flux data

WEG 4L Stable				
wind band (mph)	**geo mean - 1 std.dev flux, ton/acre/hr**	**geo mean flux ton/acre/hr**	**geo mean + 1 std.dev flux, ton/acre/hr**	**sample size, n =**
10-15	1.34E-05	3.18E-04	7.57E-03	3
15-20	2.85E-04	1.17E-03	4.81E-03	14
20-25	3.15E-04	2.33E-03	1.72E-02	9
25-30				
30-35	1.11E-03	7.34E-03	4.88E-02	9
35-40				
40-45	1.62E-03	8.47E-03	4.44E-02	6
45-50		5.54E-03		1

WEG 4L Unstable				
wind band (mph)	**geo mean - 1 std.dev flux (ton/acre/hr)**	**geo mean flux (ton/acre/hr)**	**geo mean + 1 std.dev flux (ton/acre/hr)**	**sample size n=**
10-15				
15-20	1.02E-03	1.86E-03	3.39E-03	13
20-25	1.14E-03	3.27E-03	9.35E-03	11
25-30				
30-35	3.87E-03	9.57E-03	2.36E-02	9
35-40	1.31E-02	2.98E-02	6.77E-02	2
40-45	8.29E-03	2.39E-02	6.88E-02	6
45-50		1.96E-01		1

Figure 218 – Results for flux data plots of geometric means WEG 4L – stable and unstable


Wind erodibility group 4L - stable
Geometric mean +/- 1 std.dev

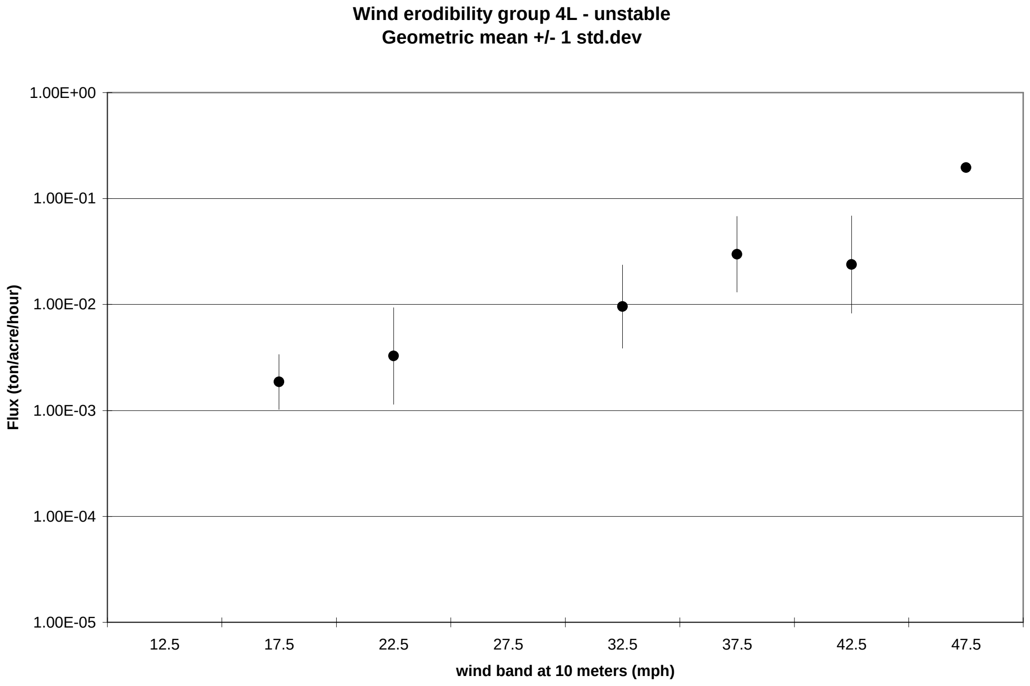
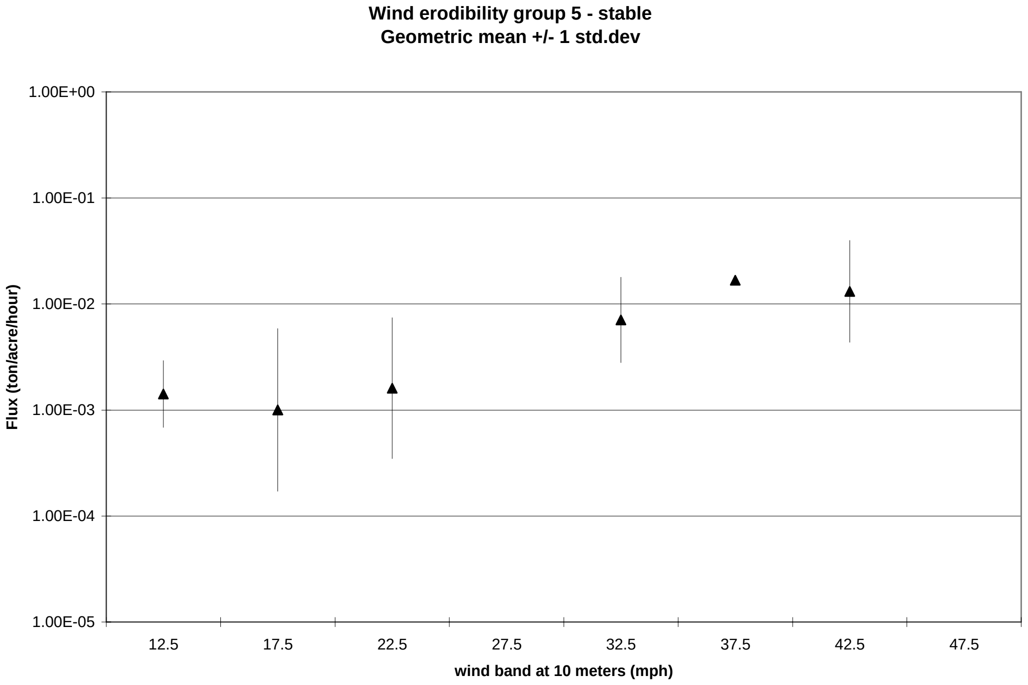

Wind erodibility group 4L - unstable
Geometric mean +/- 1 std.dev

Table 30 – Summary for WEG 5 stable and unstable – flux data

WEG 5 Stable				
wind band (mph)	**geo mean - 1 std.dev flux, ton/acre/hr**	**geo mean flux ton/acre/hr**	**geo mean + 1 std.dev flux, ton/acre/hr**	**sample size, n =**
10-15	6.84E-04	1.41E-03	2.92E-03	4
15-20	1.71E-04	1.00E-03	5.86E-03	11
20-25	3.48E-04	1.61E-03	7.42E-03	9
25-30				
30-35	2.79E-03	7.07E-03	1.79E-02	9
35-40		1.68E-02		1
40-45	4.35E-03	1.31E-02	3.97E-02	8
45-50				

WEG 5 Unstable				
wind band (mph)	**geo mean - 1 std.dev flux (ton/acre/hr)**	**geo mean flux (ton/acre/hr)**	**geo mean + 1 std.dev flux (ton/acre/hr)**	**sample size n=**
10-15	4.16E-03	1.02E-02	2.51E-02	4
15-20	7.99E-04	1.48E-03	2.75E-03	13
20-25	2.30E-03	5.74E-03	1.43E-02	10
25-30				
30-35	6.62E-03	2.10E-02	6.64E-02	11
35-40				
40-45	1.40E-02	3.26E-02	7.63E-02	7
45-50				

Figure 219 – Results for flux data plots of geometric means WEG 5 – stable and unstable



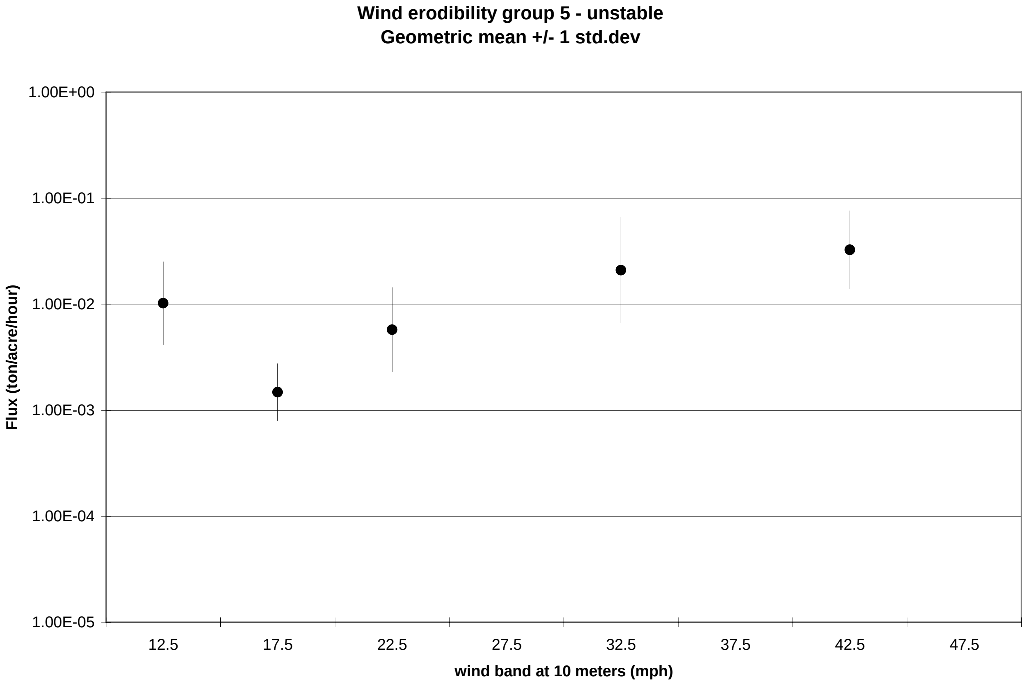
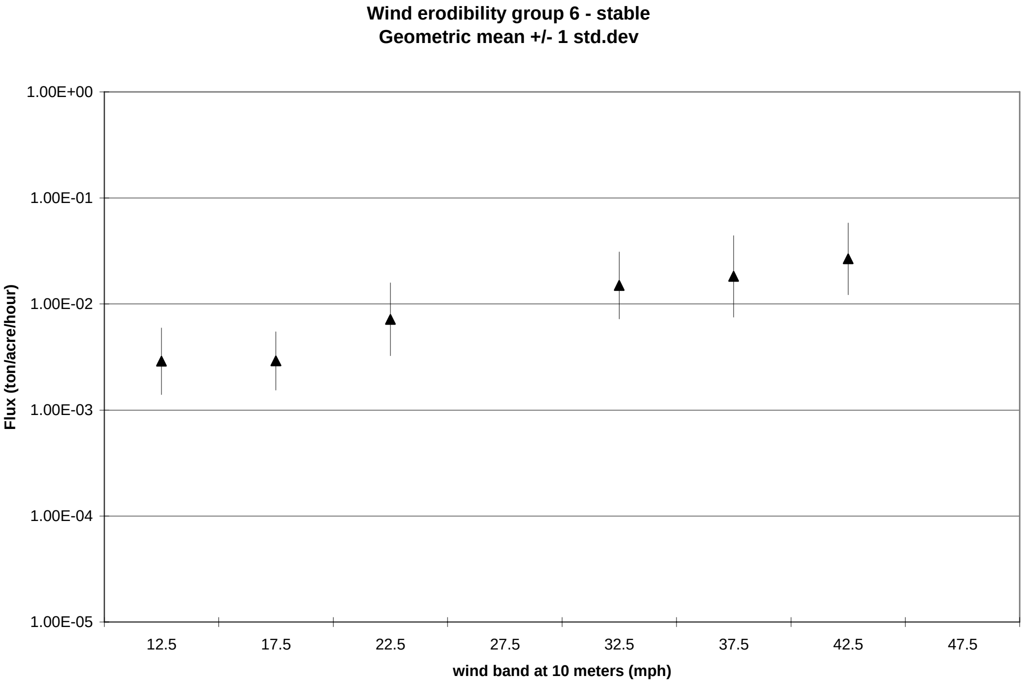


Table 31 – Summary for WEG 6 stable and unstable – flux data

WEG 6 Stable				
wind band (mph)	**geo mean - 1 std.dev flux, ton/acre/hr**	**geo mean flux ton/acre/hr**	**geo mean + 1 std.dev flux, ton/acre/hr**	**sample size, n =**
10-15	1.40E-03	2.88E-03	5.94E-03	9
15-20	1.54E-03	2.91E-03	5.48E-03	9
20-25	3.25E-03	7.17E-03	1.58E-02	9
25-30				
30-35	7.20E-03	1.50E-02	3.10E-02	10
35-40	7.51E-03	1.82E-02	4.42E-02	4
40-45	1.22E-02	2.67E-02	5.82E-02	4
45-50				

WEG 6 Unstable				
wind band (mph)	**geo mean - 1 std.dev flux (ton/acre/hr)**	**geo mean flux (ton/acre/hr)**	**geo mean + 1 std.dev flux (ton/acre/hr)**	**sample size n=**
10-15	1.27E-03	2.74E-03	5.91E-03	8
15-20	9.01E-04	1.35E-03	2.02E-03	7
20-25	3.31E-03	8.75E-03	2.32E-02	8
25-30	3.31E-02	5.44E-02	8.94E-02	2
30-35	9.82E-03	2.88E-02	8.43E-02	8
35-40	2.55E-02	6.75E-02	1.79E-01	2
40-45	2.15E-02	4.97E-02	1.15E-01	3
45-50		1.66E-02		1

Figure 220 – Results for flux data plots of geometric means WEG 6 – stable and unstable



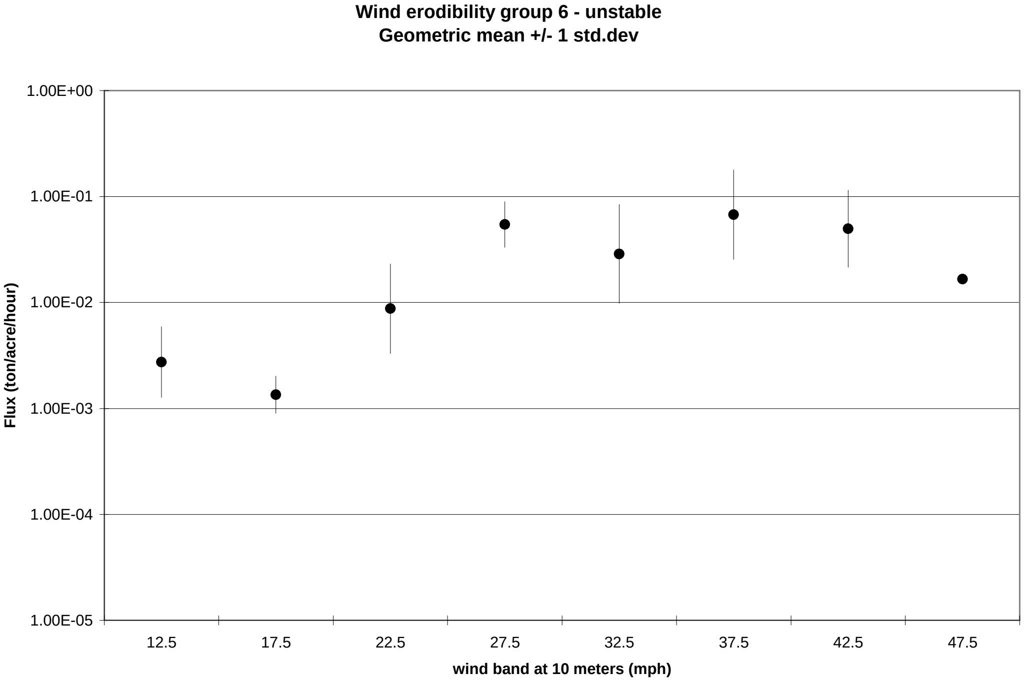


Table 32 – Summary for WEG 7 stable and unstable – flux data

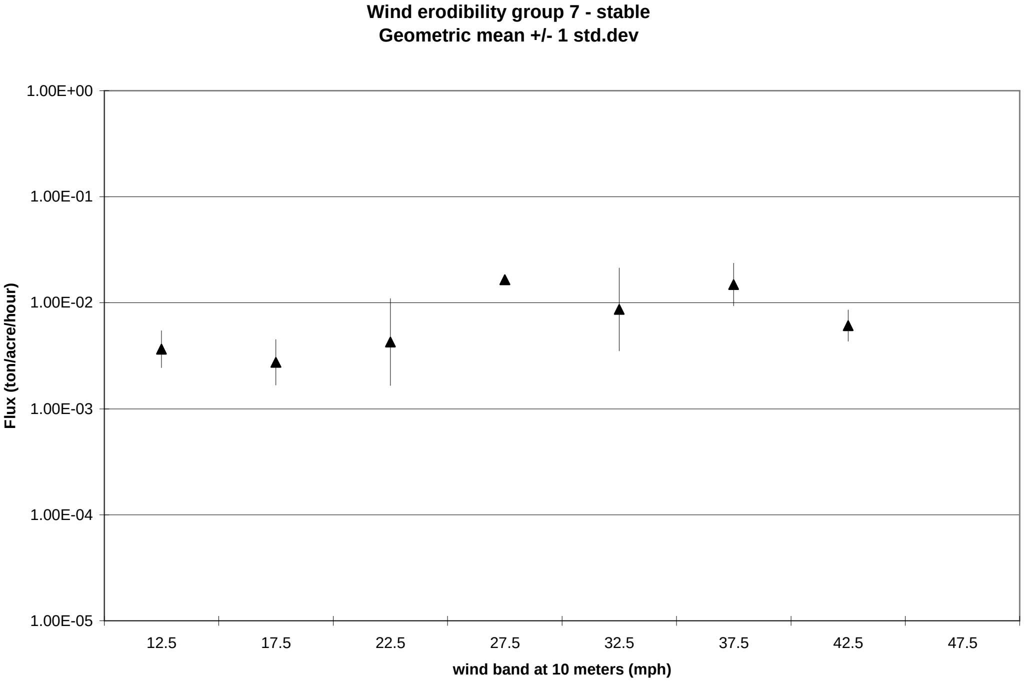
WEG 7 Stable

wind band (mph)	geo mean - 1 std.dev flux, ton/acre/hr	geo mean flux ton/acre/hr	geo mean + 1 std.dev flux, ton/acre/hr	sample size, n =
10-15	2.45E-03	3.65E-03	5.45E-03	2
15-20	1.67E-03	2.74E-03	4.50E-03	8
20-25	1.65E-03	4.26E-03	1.10E-02	6
25-30		1.65E-02		1
30-35	3.52E-03	8.66E-03	2.13E-02	6
35-40	9.35E-03	1.49E-02	2.36E-02	3
40-45	4.33E-03	6.09E-03	8.56E-03	2
45-50				

WEG 7 Unstable

wind band (mph)	geo mean - 1 std.dev flux (ton/acre/hr)	geo mean flux (ton/acre/hr)	geo mean + 1 std.dev flux (ton/acre/hr)	sample size n=
10-15	2.16E-03	3.33E-03	5.14E-03	4
15-20	7.12E-04	1.47E-03	3.04E-03	5
20-25	3.45E-03	7.79E-03	1.76E-02	8
25-30		5.17E-02		1
30-35	1.04E-02	2.19E-02	4.62E-02	6
35-40	3.43E-03	1.10E-02	3.50E-02	2
40-45	1.27E-02	3.01E-02	7.15E-02	2
45-50		1.41E-02		1

Figure 221 – Results for data plots of geometric means WEG 7 – stable and unstable



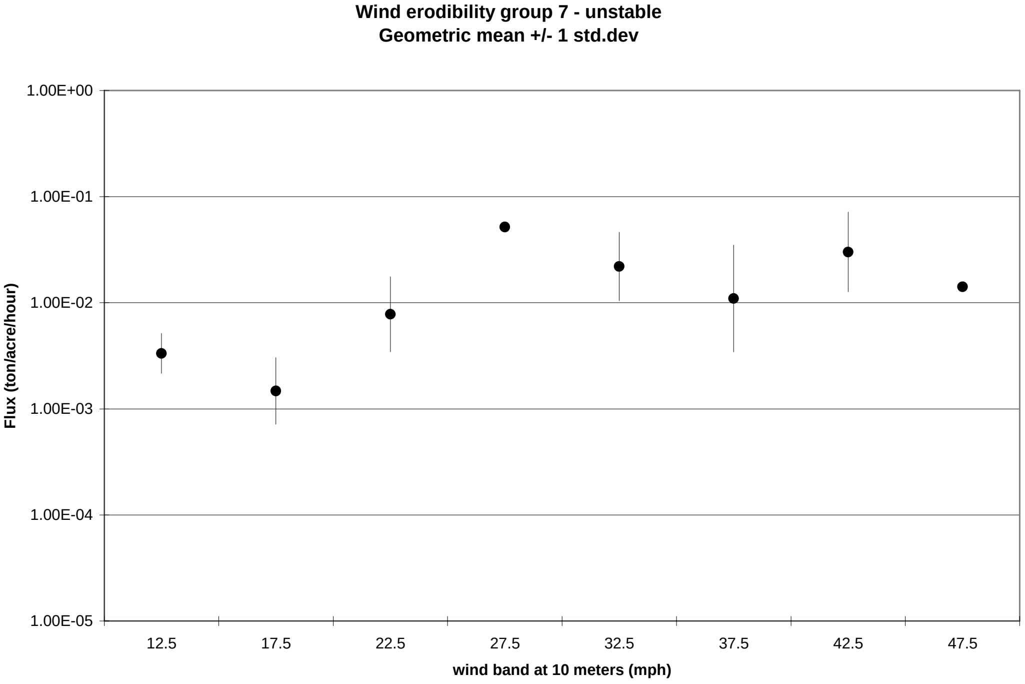


Table 33 – Summary for WEG 8 stable and unstable – flux data

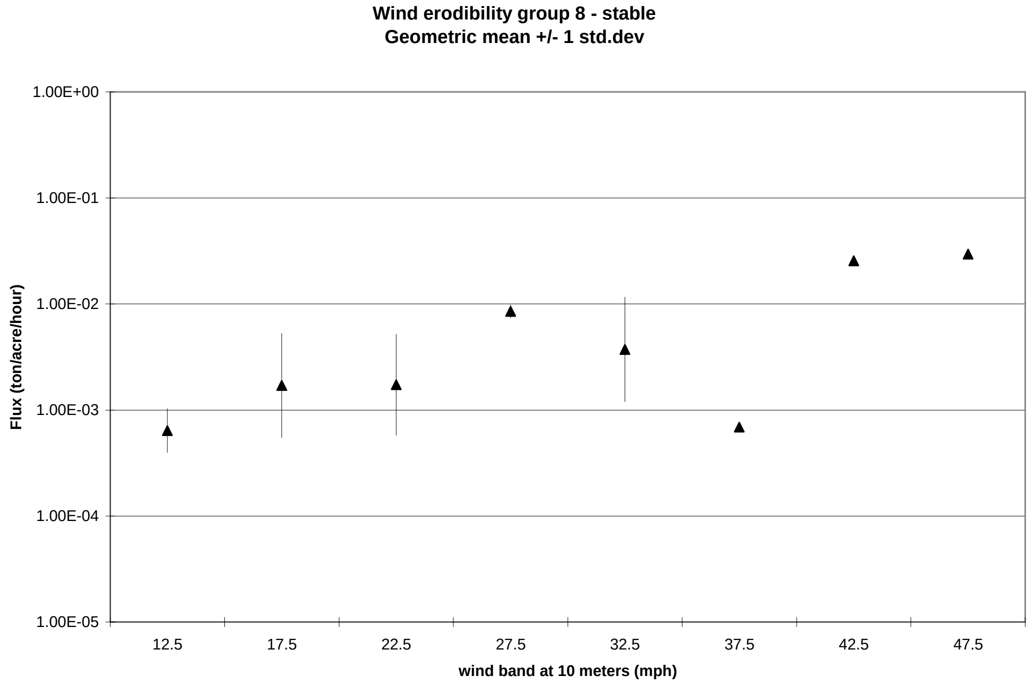
WEG 8 Stable

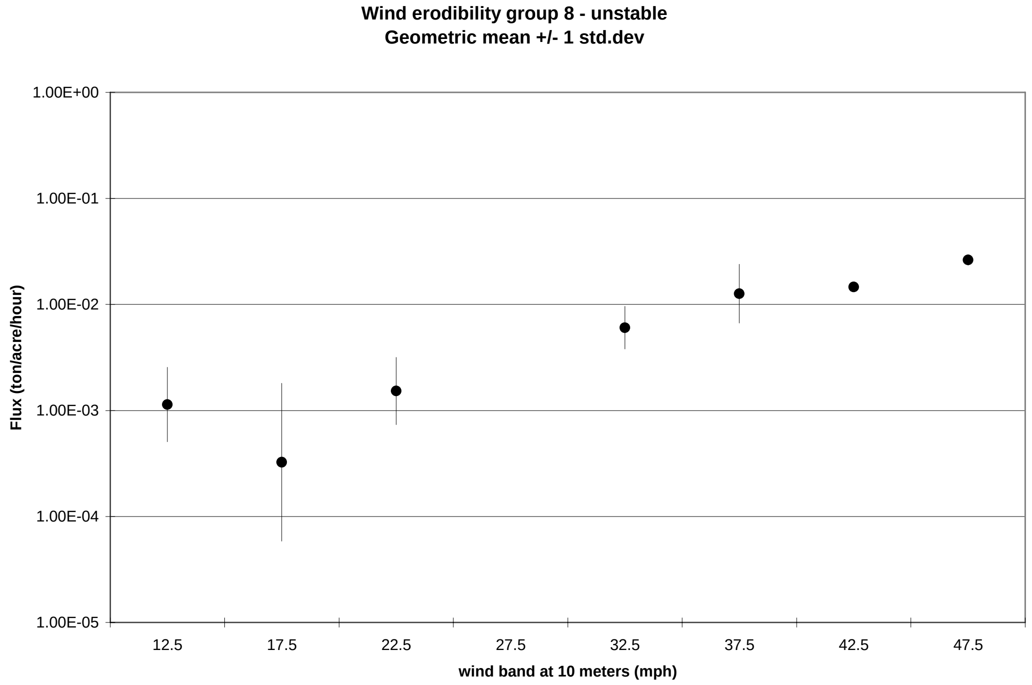
wind band (mph)	geo mean - 1 std.dev flux, ton/acre/hr	geo mean flux ton/acre/hr	geo mean + 1 std.dev flux, ton/acre/hr	sample size, n =
10-15	3.96E-04	6.39E-04	1.03E-03	4
15-20	5.50E-04	1.71E-03	5.29E-03	4
20-25	5.79E-04	1.74E-03	5.20E-03	7
25-30	7.38E-03	8.52E-03	9.82E-03	2
30-35	1.20E-03	3.73E-03	1.16E-02	5
35-40		6.89E-04		1
40-45		2.55E-02		1
45-50		2.96E-02		1

WEG 8 Unstable

wind band (mph)	geo mean - 1 std.dev flux (ton/acre/hr)	geo mean flux (ton/acre/hr)	geo mean + 1 std.dev flux (ton/acre/hr)	sample size n=
10-15	5.06E-04	1.14E-03	2.55E-03	4
15-20	5.85E-05	3.24E-04	1.80E-03	3
20-25	7.34E-04	1.53E-03	3.17E-03	7
25-30				
30-35	3.80E-03	6.05E-03	9.62E-03	5
35-40	6.68E-03	1.26E-02	2.39E-02	2
40-45		1.46E-02		1
45-50	2.35E-02	2.63E-02	2.95E-02	2

Figure 222 – Results for flux data plots of geometric means WEG 8 – stable and unstable





6.4 Statistical summary flux results, averaged over all Wind Erodibility Groups

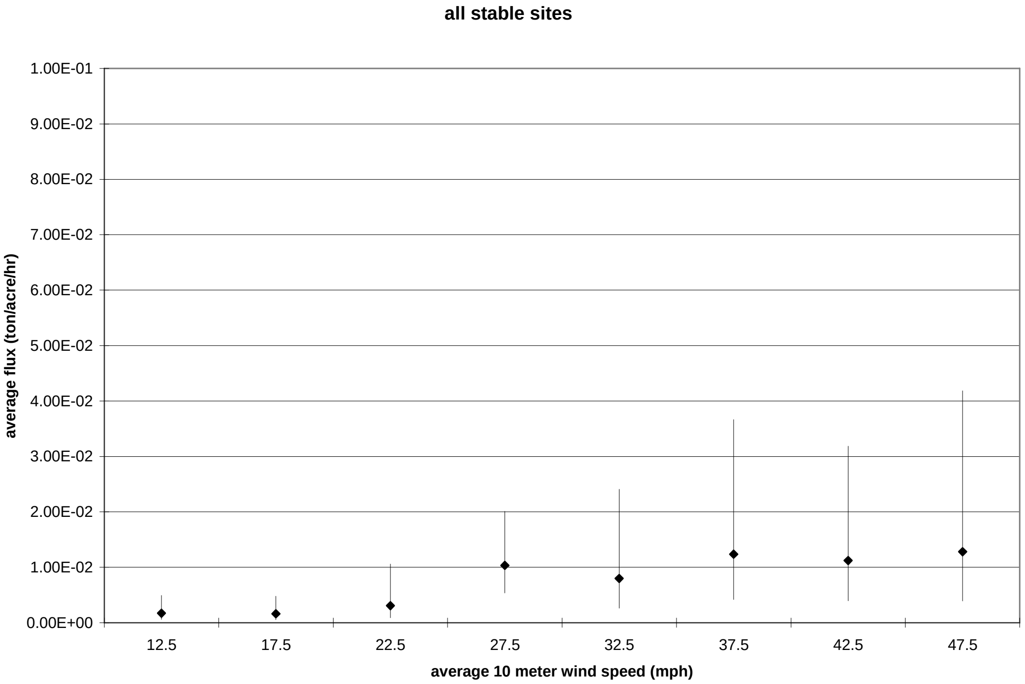
Calculations were performed to compute PM-10 fluxes averaged over all sites for both the stable and unstable conditions. Table 34 shows the cumulative flux results averaged over all stable and unstable sites. The table contains results for geometric mean, mean minus one standard deviation, mean plus one standard deviation, and sample size for every 5 mile per hour wind speed band. Figure 223 plots the Table 34 flux data, stable and unstable, against 5 mile per hour wind speed band.

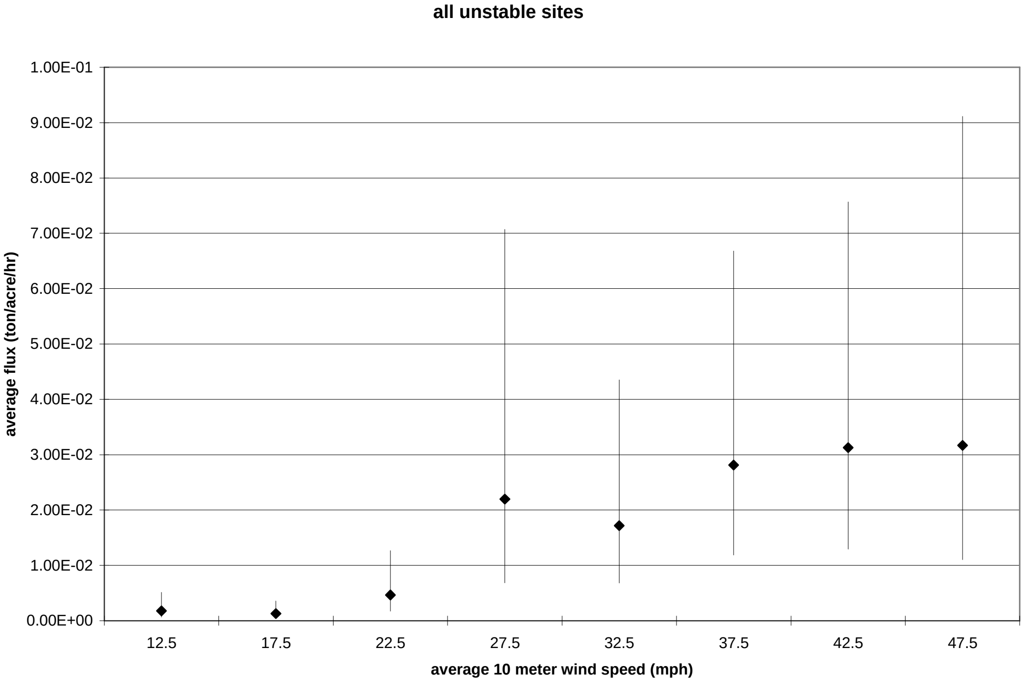
Table 34 - Summary for all Wind Erodibility Groups – 2004 flux data

ALL WEG Stable				
wind band (mph)	**geo mean - 1 std.dev flux, ton/acre/hr**	**geo mean flux ton/acre/hr**	**geo mean + 1 std.dev flux, ton/acre/hr**	**sample size, n=**
10-15	6.09E-04	1.73E-03	4.92E-03	77
15-20	5.37E-04	1.60E-03	4.78E-03	91
20-25	8.88E-04	3.07E-03	1.06E-02	97
25-30	5.35E-03	1.04E-02	2.01E-02	11
30-35	2.64E-03	7.97E-03	2.41E-02	102
35-40	4.16E-03	1.24E-02	3.67E-02	33
40-45	3.95E-03	1.12E-02	3.18E-02	41
45-50	3.91E-03	1.28E-02	4.18E-02	2

ALL WEG UNstable				
wind band (mph)	**geo mean - 1 std.dev flux, ton/acre/hr**	**geo mean flux ton/acre/hr**	**geo mean + 1 std.dev flux, ton/acre/hr**	**sample size, n=**
10-15	6.29E-04	1.80E-03	5.13E-03	63
15-20	4.66E-04	1.29E-03	3.56E-03	102
20-25	1.71E-03	4.66E-03	1.27E-02	103
25-30	6.83E-03	2.20E-02	7.07E-02	12
30-35	6.79E-03	1.72E-02	4.35E-02	96
35-40	1.19E-02	2.81E-02	6.68E-02	30
40-45	1.29E-02	3.13E-02	7.57E-02	46
45-50	1.10E-02	3.17E-02	9.11E-02	5

Figure 223 – Plot summary for flux data for all WEG – stable and unstable sites. Midpoints of the speed ranges are used to indicate the wind bands





Data set sizes for the stable and unstable 25-30 mph wind bands (n = 11 for stable and n = 12 unstable) are much smaller than for the 20-25 mph and 30-35 mph wind bands because of the effort in the field to set the velocity in the tunnel working section to values at or near 25, 35 and 45 mph. The field team was more likely to slightly under-shoot the target wind speed than over-shoot the wind speed. As a result, the 20-25 mph wind band has a large data set size because of the effort to attain a 25 mph wind speed, and the 30-35 mph wind band data set size is also large because of the effort to attain a 35 mph wind speed. Computed mean PM-10 emission factors are slightly higher for the 25-30 mph wind band, but this is probably a statistical anomaly because of the relatively small data set size compared to the data set sizes for the 20-25 and 30-35 mph wind bands.

Data are unreliable for the 45-50 mph wind bands because of the small data set sizes (n = 2 for stable and n =1 for unstable). Few data points were obtained in the 45-50 mph wind band because of the limited power of the tunnel fan motor (746 watts).

6.5 Individual Wind Erodibility Group spike statistical summary results

Geometric averages, standard deviations and sample size results for spikes in five mile per hour wind speed bands, classified by Wind Erodibility Group and stability condition are shown in Tables 35 to 43 and Figures 224 to 232.

Table 35 – Summary for WEG unclassified stable and unstable – spike data

INDIVIDUAL

WEG Unclassified Stable - Spike				
wind band (mph)	geo mean - 1 std.dev spike, ton/acre	geo mean spike ton/acre	geo mean + 1 std.dev spike, ton/acre	sample size, n=
10-15	1.23E-07	1.61E-06	2.11E-05	3
15-20	1.50E-07	2.96E-07	5.85E-07	2
20-25	9.85E-06	2.90E-05	8.55E-05	3
25-30				
30-35	6.51E-05	1.48E-04	3.35E-04	3
35-40		9.12E-05		1
40-45	6.30E-05	8.87E-05	1.25E-04	2
45-50				

WEG Unclassified Unstable - Spike				
wind band (mph)	geo mean - 1 std.dev spike, ton/acre	geo mean spike ton/acre	geo mean + 1 std.dev spike, ton/acre	sample size n=
10-15	4.33E-07	2.24E-06	1.16E-05	4
15-20	3.87E-07	5.31E-07	7.30E-07	2
20-25	4.05E-05	1.77E-04	7.76E-04	3
25-30				
30-35	2.54E-04	6.14E-04	1.48E-03	4
35-40		2.66E-04		1
40-45		1.04E-03		1
45-50				

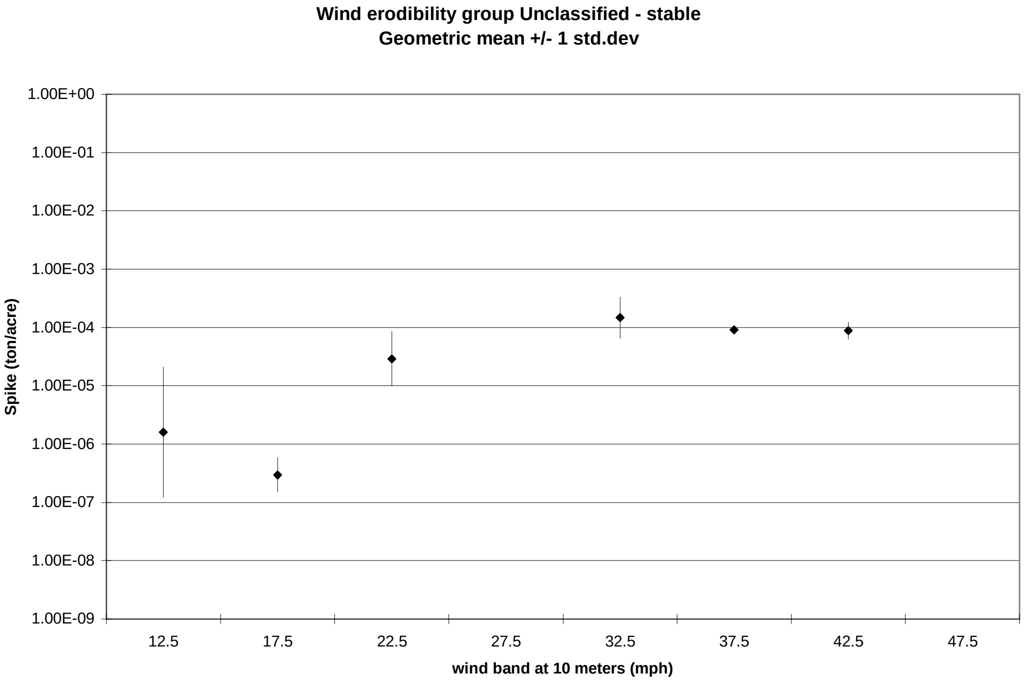
CUMULATIVE

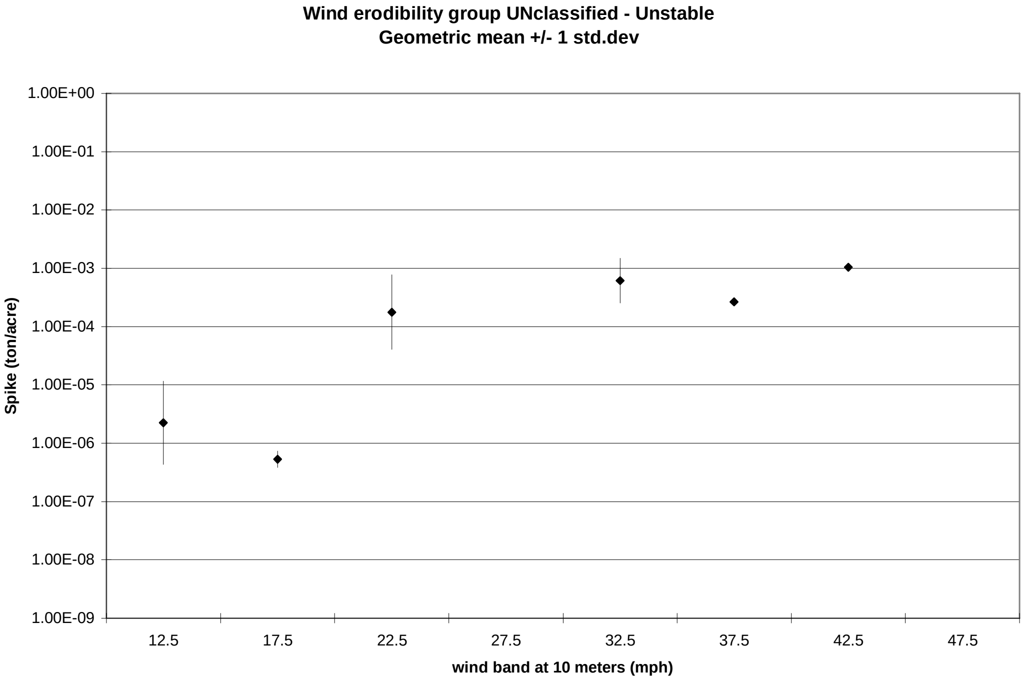
WEG Unclassified Stable - Spike				
wind band (mph)	geo mean - 1 std.dev spike, ton/acre	geo mean spike ton/acre	geo mean + 1 std.dev spike, ton/acre	sample size, n=
10-15	1.23E-07	1.61E-06	2.12E-05	3
15-20	4.48E-07	5.64E-07	7.08E-07	2
20-25	1.05E-05	3.25E-05	1.01E-04	3
25-30				
30-35	8.13E-05	1.85E-04	4.19E-04	3
35-40		2.39E-04		1
40-45	1.70E-04	3.30E-04	6.41E-04	2
45-50				

WEG Unclassified Unstable - Spike				
wind band (mph)	geo mean - 1 std.dev spike, ton/acre	geo mean spike ton/acre	geo mean + 1 std.dev spike, ton/acre	sample size n=
10-15	5.51E-07	3.37E-06	2.06E-05	4
15-20	3.49E-07	6.80E-07	1.32E-06	2
20-25	4.20E-05	1.83E-04	7.94E-04	3
25-30				
30-35	4.62E-04	1.28E-03	3.54E-03	4
35-40		1.15E-03		1
40-45		1.40E-03		1
45-50				

Figure 224 – Results for spike data plots of geometric means WEG UN – stable and unstable

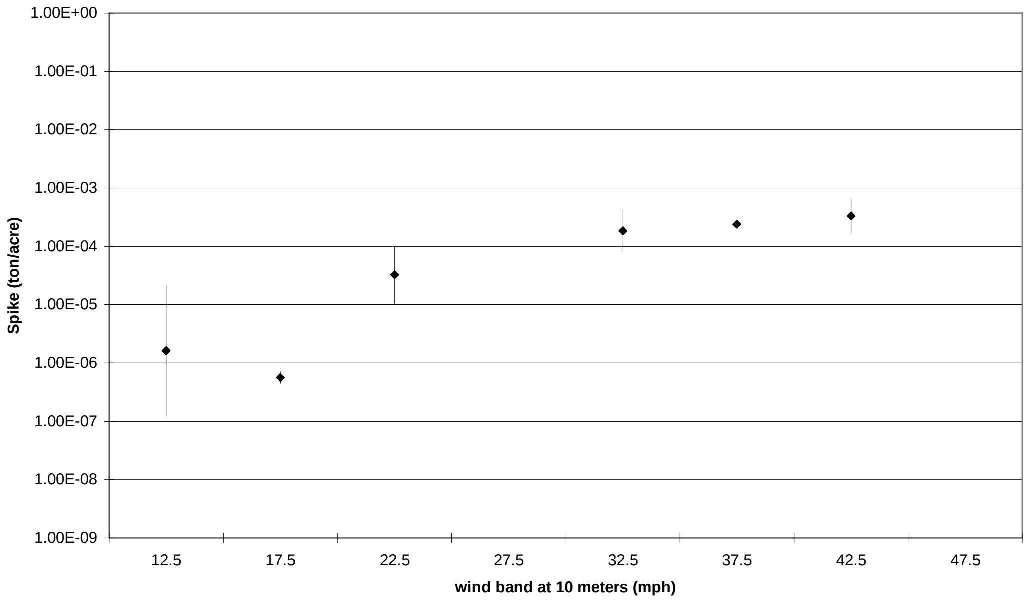
INDIVIDUAL





CUMULATIVE

Wind erodibility group Unclassified - stable - cumulative
Geometric mean +/- 1 std.dev



Wind erodibility group Unclassified - unstable - cumulative
Geometric mean +/- 1 std.dev

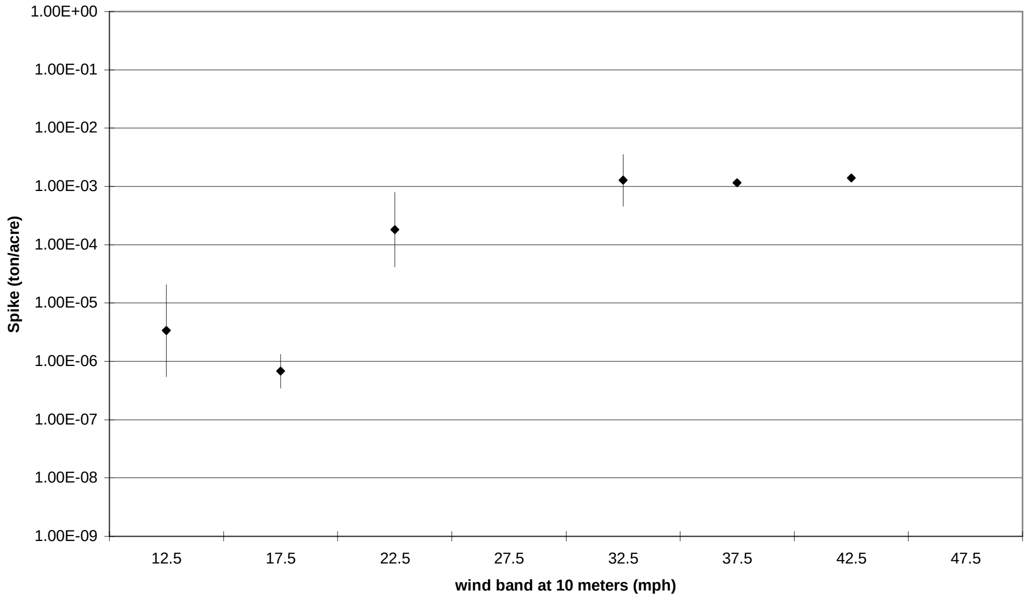


Table 36 – Summary for WEG 2 stable and unstable – spike data

INDIVIDUAL

WEG 2 Stable - Spike				
wind band (mph)	**geo mean - 1 std.dev spike, ton/acre**	**geo mean spike ton/acre**	**geo mean + 1 std.dev spike, ton/acre**	**sample size, n=**
10-15	3.76E-08	1.22E-07	3.96E-07	8
15-20	1.33E-09	1.41E-08	1.48E-07	11
20-25	2.60E-08	4.79E-07	8.83E-06	10
25-30		1.66E-06		1
30-35	1.12E-06	3.15E-06	8.87E-06	15
35-40	3.28E-07	1.35E-06	5.55E-06	7
40-45	1.09E-05	1.51E-05	2.10E-05	2
45-50				

WEG 2 Unstable - Spike				
wind band (mph)	**geo mean - 1 std.dev spike, ton/acre**	**geo mean spike ton/acre**	**geo mean + 1 std.dev spike, ton/acre**	**sample size n=**
10-15	4.64E-08	5.70E-07	7.00E-06	6
15-20	3.28E-07	2.94E-06	2.62E-05	12
20-25	2.66E-05	1.24E-04	5.81E-04	14
25-30	2.12E-05	1.40E-04	9.25E-04	2
30-35	4.74E-04	1.09E-03	2.51E-03	12
35-40	1.36E-04	1.83E-04	2.46E-04	4
40-45	1.39E-03	2.65E-03	5.05E-03	6
45-50				

CUMULATIVE

WEG 2 Stable - Spike

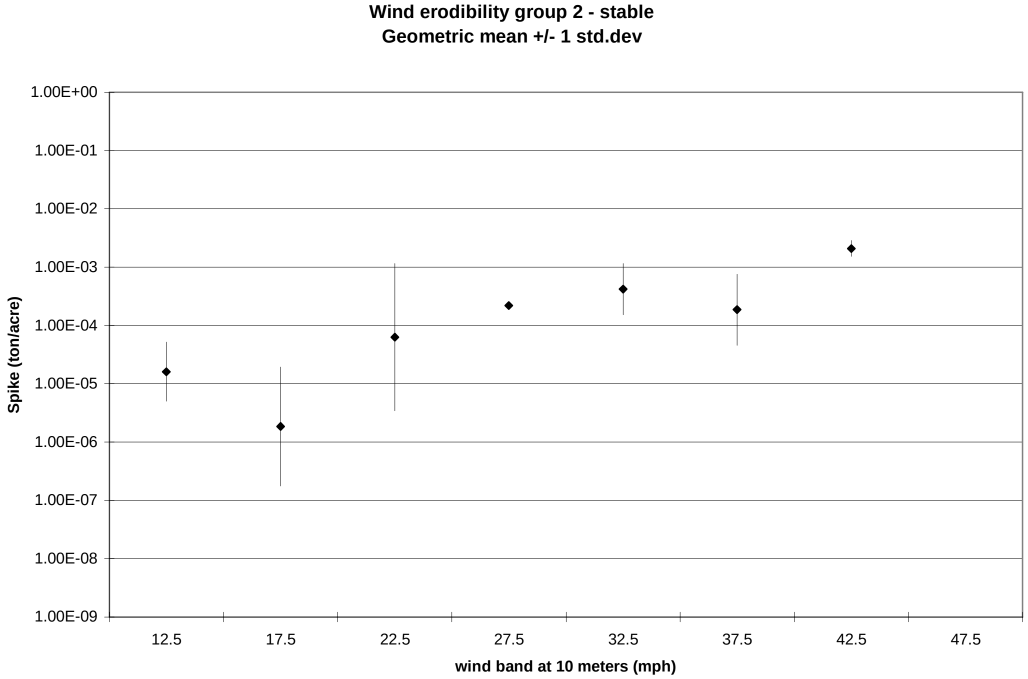
wind band (mph)	geo mean - 1 std.dev spike, ton/acre	geo mean spike ton/acre	geo mean + 1 std.dev spike, ton/acre	sample size, n=
10-15	5.96E-06	2.02E-05	6.82E-05	9
15-20	2.11E-07	3.20E-06	4.86E-05	13
20-25	7.35E-06	8.43E-05	9.67E-04	11
25-30		2.20E-04		1
30-35	2.84E-04	7.71E-04	2.09E-03	15
35-40	2.51E-04	8.57E-04	2.92E-03	7
40-45	3.00E-03	3.36E-03	3.76E-03	2
45-50				

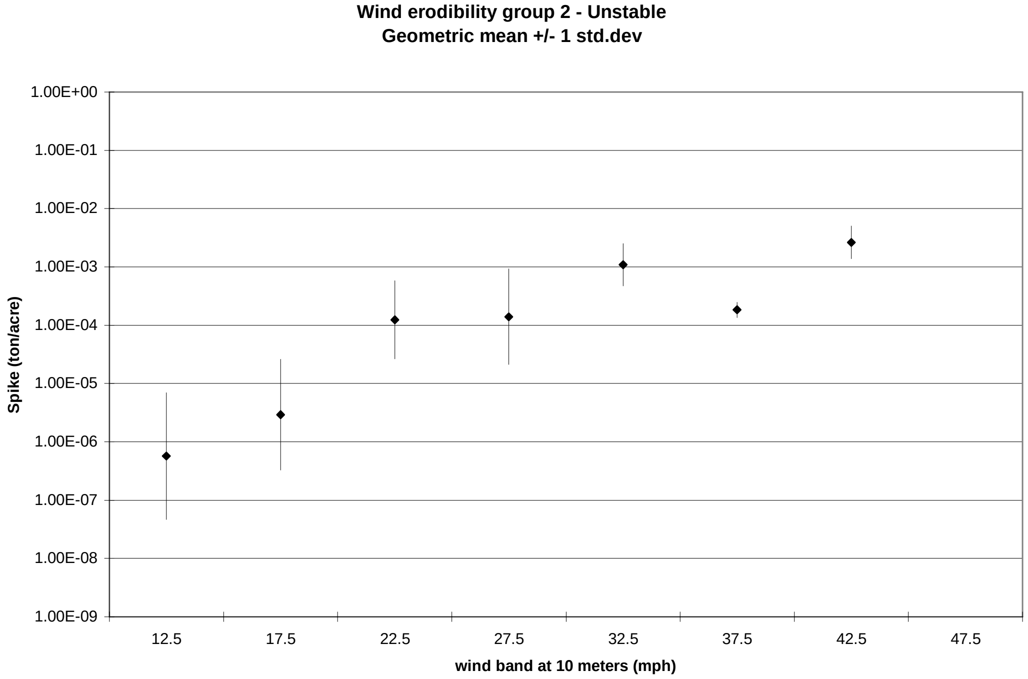
WEG 2 Unstable - Spike

wind band (mph)	geo mean - 1 std.dev spike, ton/acre	geo mean spike ton/acre	geo mean + 1 std.dev spike, ton/acre	sample size n=
10-15	2.37E-07	1.25E-06	6.64E-06	6
15-20	6.99E-07	5.79E-06	4.79E-05	14
20-25	3.84E-05	1.51E-04	5.90E-04	14
25-30	8.20E-04	8.45E-04	8.72E-04	2
30-35	6.20E-04	1.51E-03	3.68E-03	12
35-40	1.51E-03	1.79E-03	2.14E-03	4
40-45	1.86E-03	3.82E-03	7.85E-03	6
45-50				

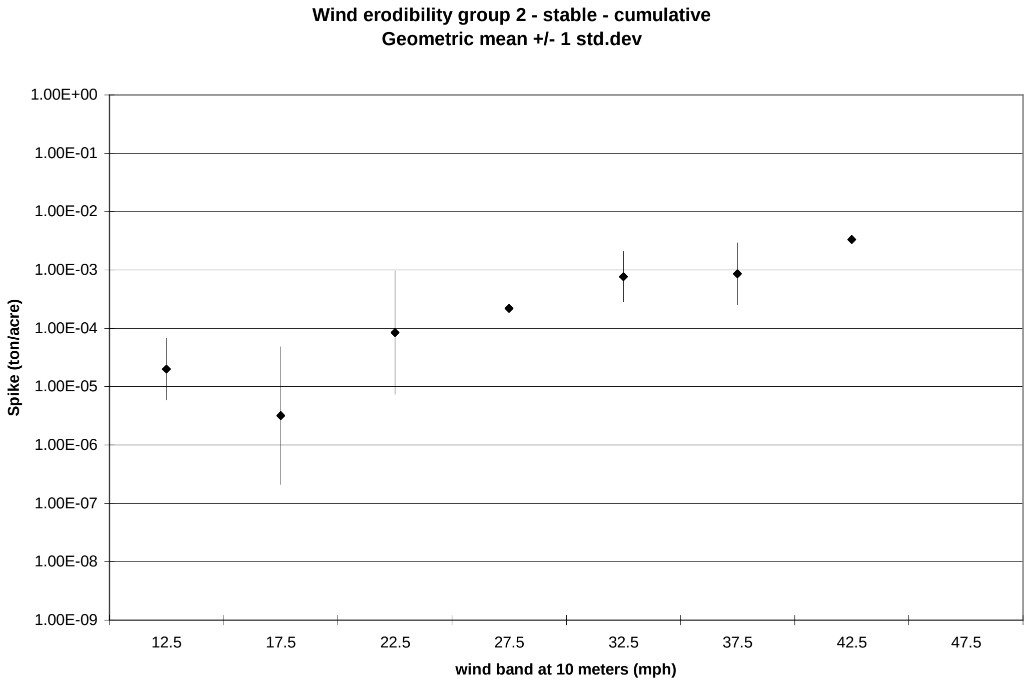
Figure 225 – Results for spike data plots of geometric means WEG 2 – stable and unstable

INDIVIDUAL





CUMULATIVE


Wind erodibility group 2 - stable - cumulative
Geometric mean +/- 1 std.dev
1.00E+00
1.00E-01
1.00E-02
1.00E-03
1.00E-04
1.00E-05
1.00E-06
1.00E-07
1.00E-08
1.00E-09
Spike (ton/acre)
12.5
17.5
22.5
27.5
32.5
37.5
42.5
47.5
wind band at 10 meters (mph)

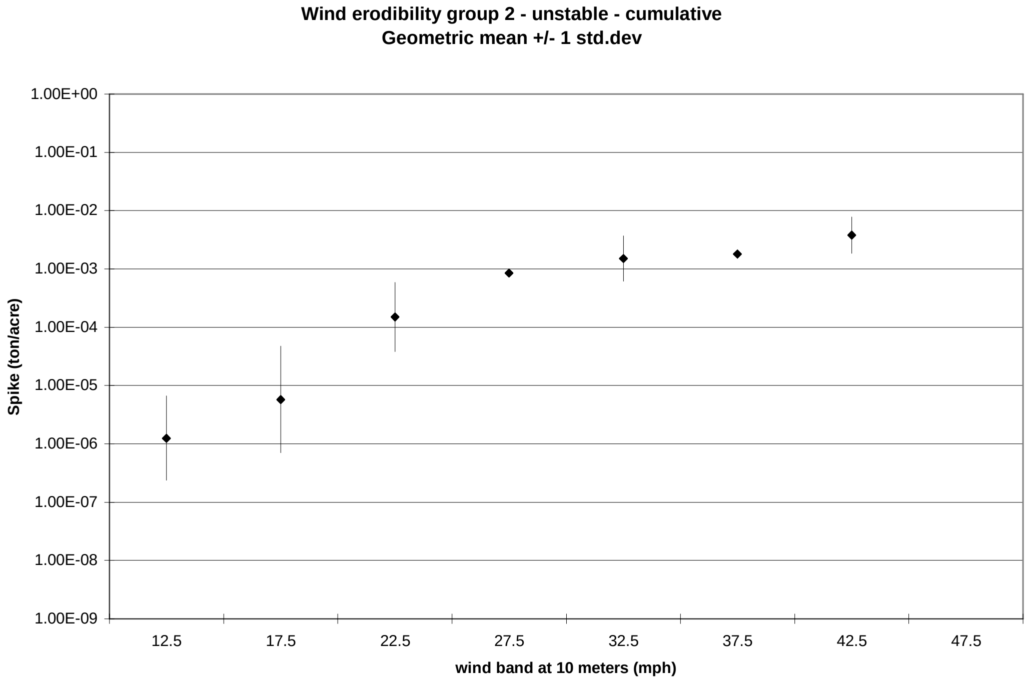

Wind erodibility group 2 - unstable - cumulative
Geometric mean +/- 1 std.dev
1.00E+00
1.00E-01
1.00E-02
1.00E-03
1.00E-04
1.00E-05
1.00E-06
1.00E-07
1.00E-08
1.00E-09
Spike (ton/acre)
12.5
17.5
22.5
27.5
32.5
37.5
42.5
47.5
wind band at 10 meters (mph)

Table 37 – Summary for WEG 3 stable and unstable – spike data

INDIVIDUAL

WEG 3 Stable - Spike				
wind band (mph)	**geo mean - 1 std.dev spike, ton/acre**	**geo mean spike ton/acre**	**geo mean + 1 std.dev spike, ton/acre**	**sample size, n=**
10-15	5.61E-07	3.27E-06	1.91E-05	14
15-20	2.60E-07	2.75E-06	2.92E-05	15
20-25	5.64E-06	3.94E-05	2.76E-04	19
25-30				
30-35	5.99E-05	2.13E-04	7.58E-04	22
35-40	4.48E-06	2.11E-05	9.95E-05	5
40-45	1.54E-04	2.77E-04	4.98E-04	9
45-50				

WEG 3 Unstable - Spike				
wind band (mph)	**geo mean - 1 std.dev spike, ton/acre**	**geo mean spike ton/acre**	**geo mean + 1 std.dev spike, ton/acre**	**sample size n=**
10-15	4.33E-07	3.42E-06	2.71E-05	11
15-20	2.15E-07	1.75E-06	1.43E-05	21
20-25	2.09E-05	6.96E-05	2.32E-04	20
25-30				
30-35	1.06E-04	4.30E-04	1.75E-03	19
35-40	1.67E-04	5.74E-04	1.97E-03	4
40-45	1.59E-04	7.90E-04	3.92E-03	13
45-50				

CUMULATIVE

WEG 3 Stable - Spike

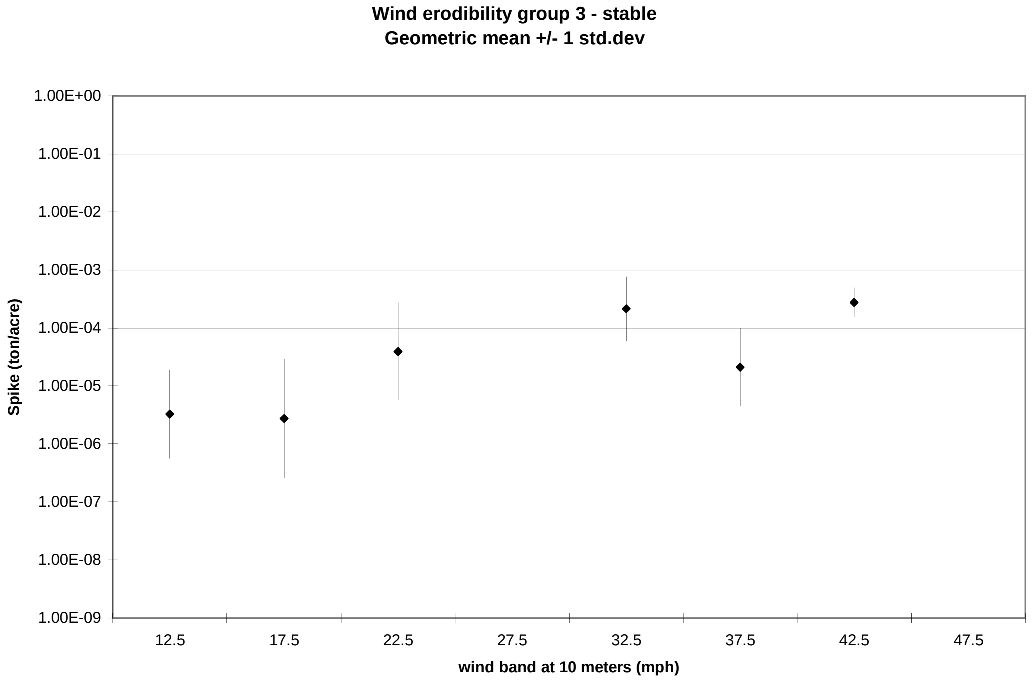
wind band (mph)	geo mean - 1 std.dev spike, ton/acre	geo mean spike ton/acre	geo mean + 1 std.dev spike, ton/acre	sample size, n=
10-15	1.65E-06	7.76E-06	3.65E-05	16
15-20	3.28E-07	5.60E-06	9.57E-05	16
20-25	8.73E-06	5.36E-05	3.30E-04	20
25-30				
30-35	1.30E-04	4.26E-04	1.39E-03	22
35-40	6.59E-05	2.88E-04	1.25E-03	5
40-45	3.04E-04	4.96E-04	8.07E-04	8
45-50				

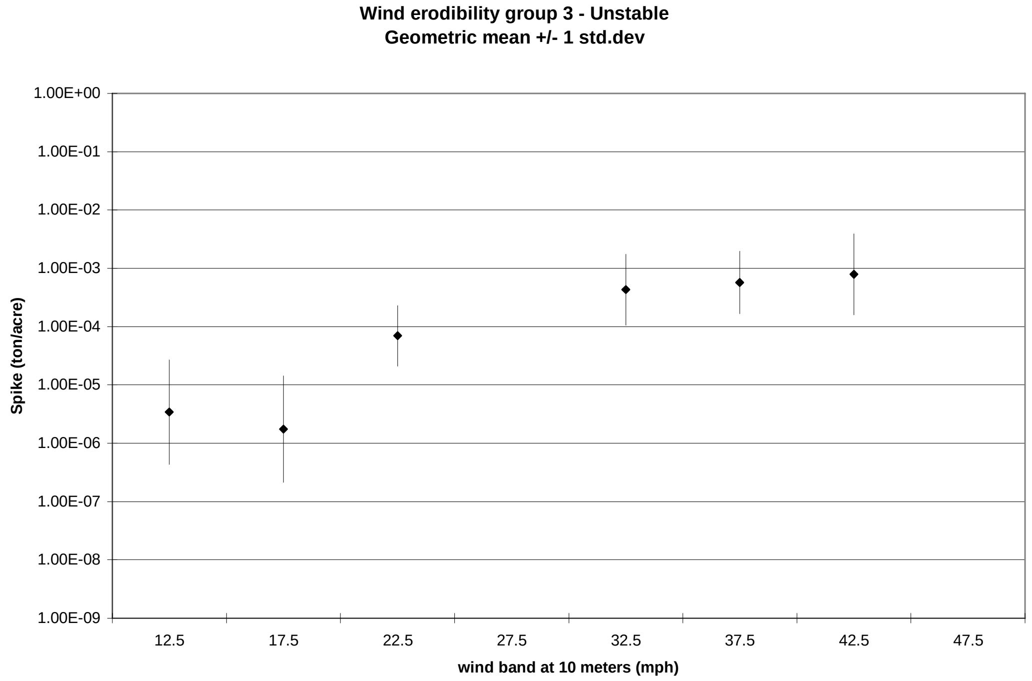
WEG 3 Unstable - Spike

wind band (mph)	geo mean - 1 std.dev spike, ton/acre	geo mean spike ton/acre	geo mean + 1 std.dev spike, ton/acre	sample size n=
10-15	1.62E-06	1.07E-05	7.03E-05	11
15-20	6.06E-07	3.84E-06	2.43E-05	23
20-25	3.05E-05	9.21E-05	2.78E-04	20
25-30				
30-35	2.41E-04	6.61E-04	1.81E-03	19
35-40	4.75E-04	1.45E-03	4.41E-03	4
40-45	4.11E-04	1.34E-03	4.40E-03	14
45-50				

Figure 226 – Results for spike data plots of geometric means WEG 3 – stable and unstable

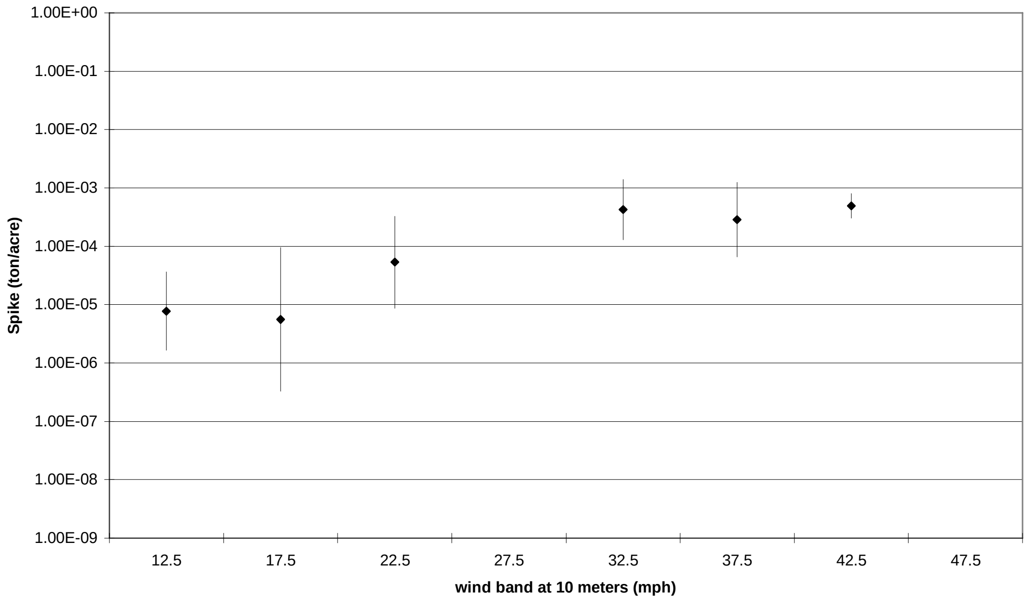
INDIVIDUAL





CUMULATIVE

Wind erodibility group 3 - stable - cumulative
Geometric mean +/- 1 std.dev



Wind erodibility group 3 - unstable - cumulative
Geometric mean +/- 1 std.dev

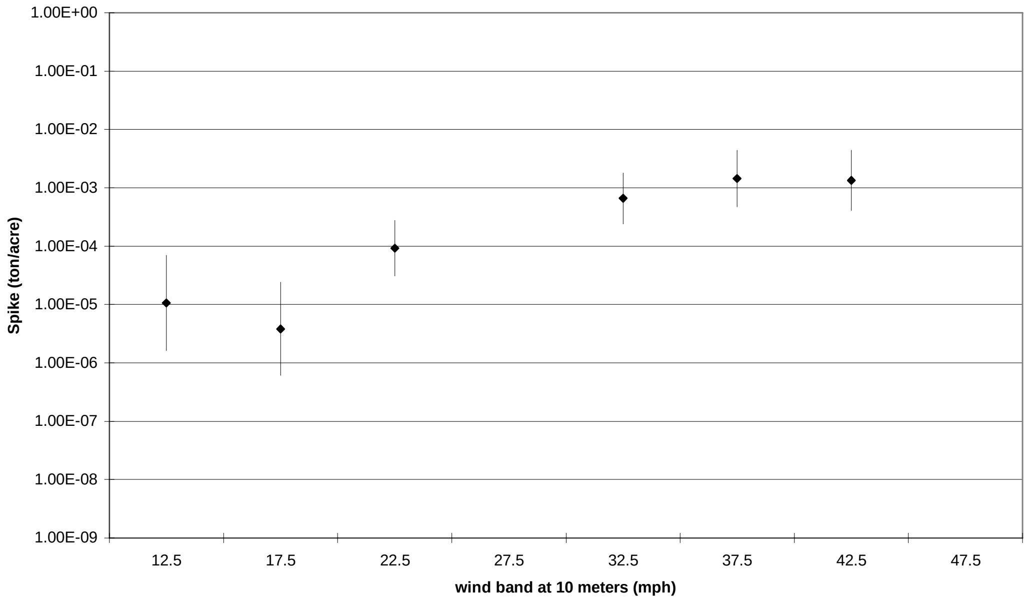


Table 38 – Summary for WEG 4 stable and unstable – spike data

INDIVIDUAL

WEG 4 Stable - Spike				
wind band (mph)	**geo mean - 1 std.dev spike, ton/acre**	**geo mean spike ton/acre**	**geo mean + 1 std.dev spike, ton/acre**	**sample size, n=**
10-15	6.28E-07	6.49E-06	6.71E-05	21
15-20	1.05E-06	7.56E-06	5.45E-05	14
20-25	1.06E-05	7.16E-05	4.85E-04	24
25-30	1.78E-05	5.72E-05	1.84E-04	7
30-35	3.21E-05	1.93E-04	1.16E-03	22
35-40	1.90E-05	1.73E-04	1.57E-03	11
40-45	1.25E-04	3.67E-04	1.07E-03	7
45-50				

WEG 4 Unstable - Spike				
wind band (mph)	**geo mean - 1 std.dev spike, ton/acre**	**geo mean spike ton/acre**	**geo mean + 1 std.dev spike, ton/acre**	**sample size n=**
10-15	1.65E-07	6.87E-07	2.86E-06	22
15-20	1.76E-07	2.64E-06	3.97E-05	21
20-25	4.15E-05	1.97E-04	9.35E-04	22
25-30	3.00E-05	2.91E-04	2.81E-03	7
30-35	5.07E-04	1.19E-03	2.80E-03	22
35-40	1.03E-04	3.96E-04	1.52E-03	13
40-45	9.20E-04	2.27E-03	5.62E-03	6
45-50				

CUMULATIVE

WEG 4 Stable - Spike

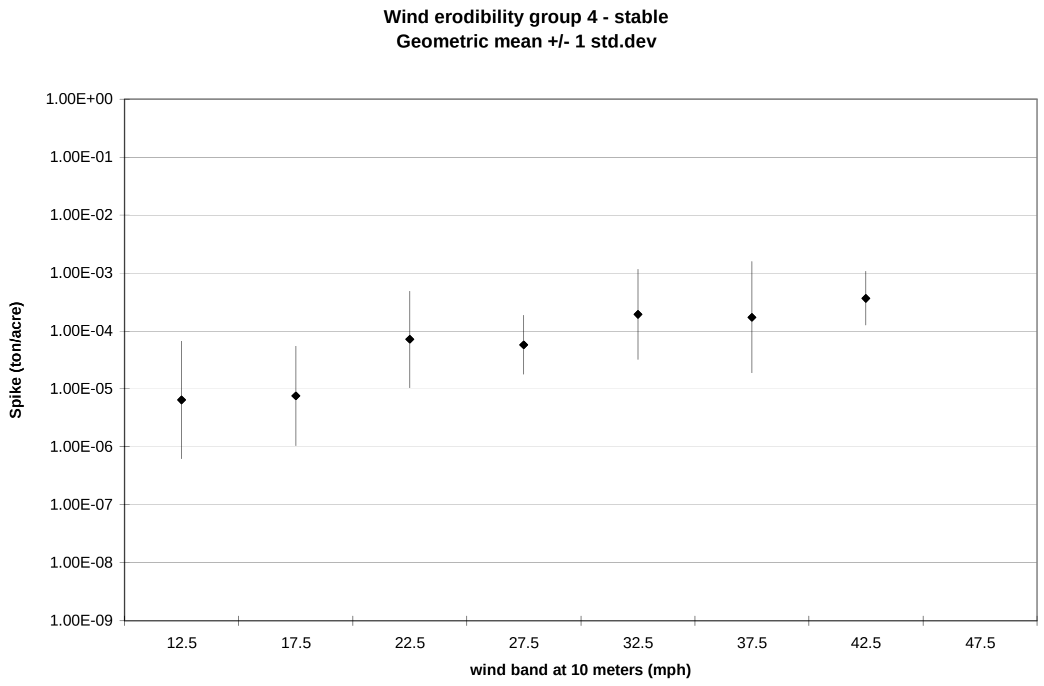
wind band (mph)	geo mean - 1 std.dev spike, ton/acre	geo mean spike ton/acre	geo mean + 1 std.dev spike, ton/acre	sample size, n=
10-15	3.26E-06	2.09E-05	1.34E-04	25
15-20	7.73E-06	2.87E-05	1.07E-04	15
20-25	6.32E-05	1.55E-04	3.81E-04	24
25-30	3.83E-04	6.13E-04	9.80E-04	7
30-35	1.69E-04	4.52E-04	1.21E-03	23
35-40	3.42E-04	9.29E-04	2.52E-03	12
40-45	2.49E-04	7.08E-04	2.02E-03	7
45-50				

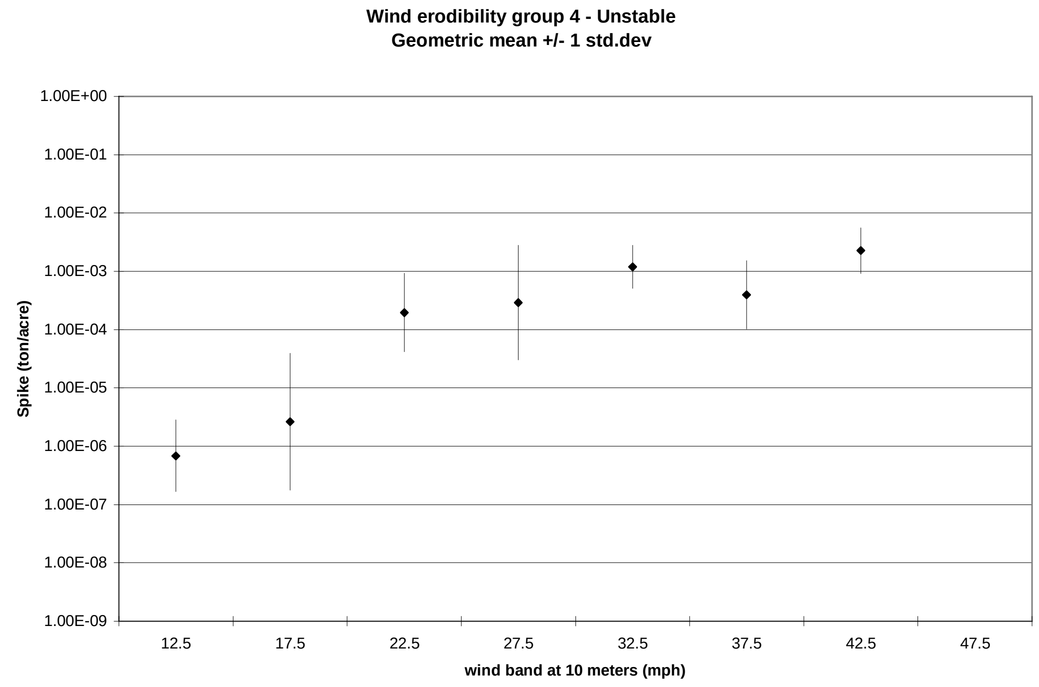
WEG 4 Unstable - Spike

wind band (mph)	geo mean - 1 std.dev spike, ton/acre	geo mean spike ton/acre	geo mean + 1 std.dev spike, ton/acre	sample size n=
10-15	3.05E-07	1.08E-06	3.86E-06	24
15-20	3.75E-07	5.85E-06	9.12E-05	23
20-25	6.47E-05	2.51E-04	9.78E-04	22
25-30	9.02E-05	6.15E-04	4.19E-03	7
30-35	9.14E-04	1.97E-03	4.27E-03	22
35-40	6.27E-04	1.66E-03	4.37E-03	12
40-45	1.54E-03	3.37E-03	7.38E-03	7
45-50				

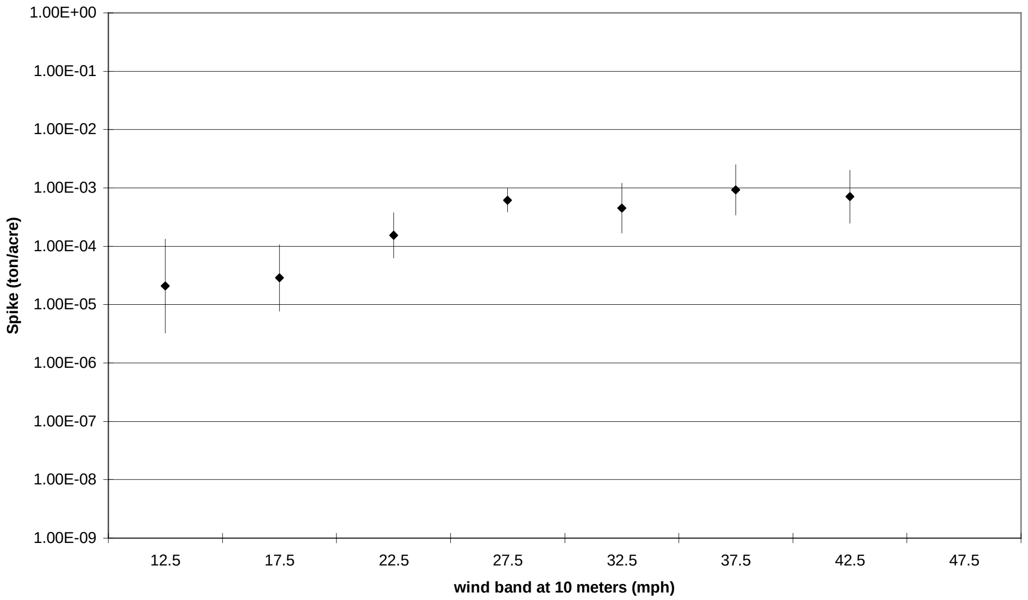
Figure 227 – Results for spike data plots of geometric means WEG 4 – stable and unstable

INDIVIDUAL





CUMULATIVE


Wind erodibility group 4 - stable - cumulative
Geometric mean +/- 1 std.dev

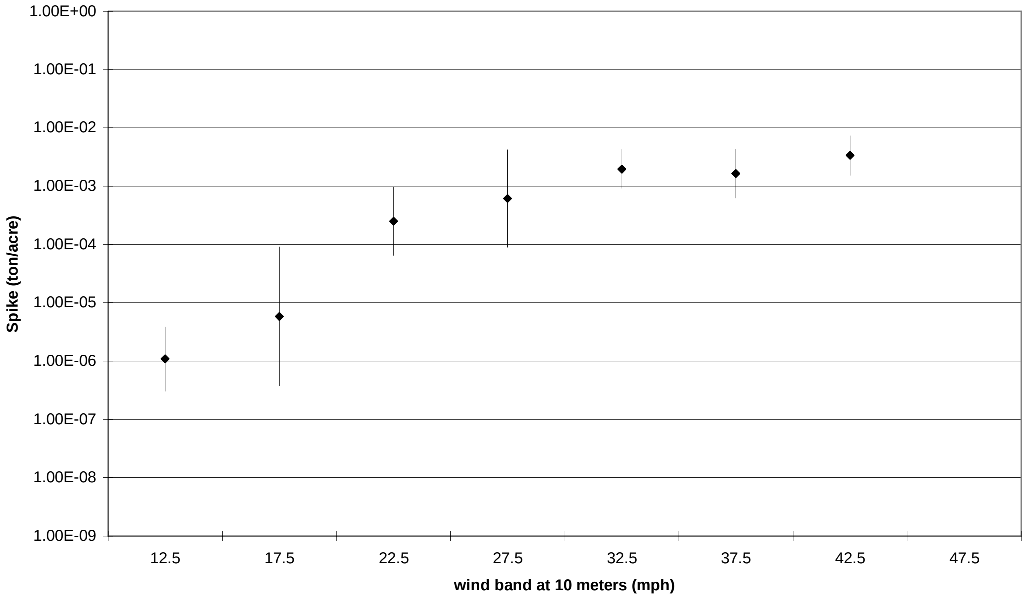

Wind erodibility group 4 - unstable - cumulative
Geometric mean +/- 1 std.dev

Table 39 – Summary for WEG 4L stable and unstable – spike data

INDIVIDUAL

WEG 4L Stable - Spike				
wind band (mph)	geo mean - 1 std.dev spike, ton/acre	geo mean spike ton/acre	geo mean + 1 std.dev spike, ton/acre	sample size, n=
10-15	1.78E-08	1.02E-06	5.81E-05	3
15-20	6.45E-07	6.18E-06	5.92E-05	14
20-25	9.64E-07	3.29E-05	1.12E-03	9
25-30				
30-35	6.13E-05	3.45E-04	1.94E-03	9
35-40				
40-45	5.99E-05	3.30E-04	1.82E-03	6
45-50		1.93E-04		1

WEG 4L Unstable - Spike				
wind band (mph)	geo mean - 1 std.dev spike, ton/acre	geo mean spike ton/acre	geo mean + 1 std.dev spike, ton/acre	sample size n=
10-15				
15-20	3.35E-07	4.79E-06	6.86E-05	13
20-25	4.60E-06	4.10E-05	3.66E-04	11
25-30				
30-35	2.52E-04	5.40E-04	1.15E-03	9
35-40	5.80E-04	1.30E-03	2.90E-03	2
40-45	2.83E-04	8.63E-04	2.63E-03	6
45-50		5.34E-03		1

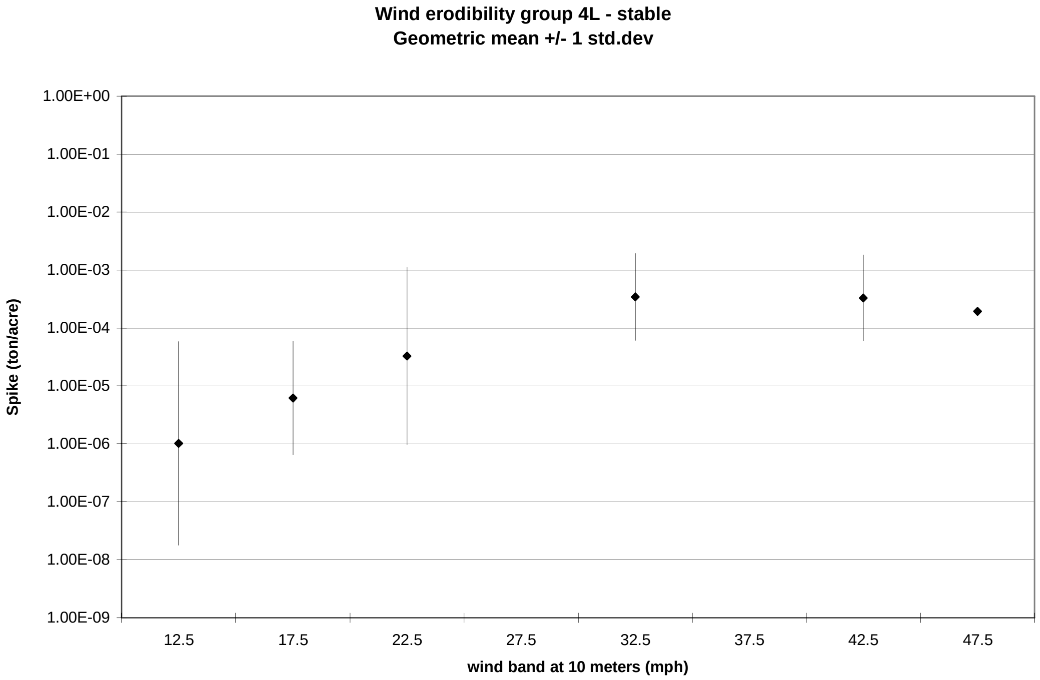
CUMULATIVE

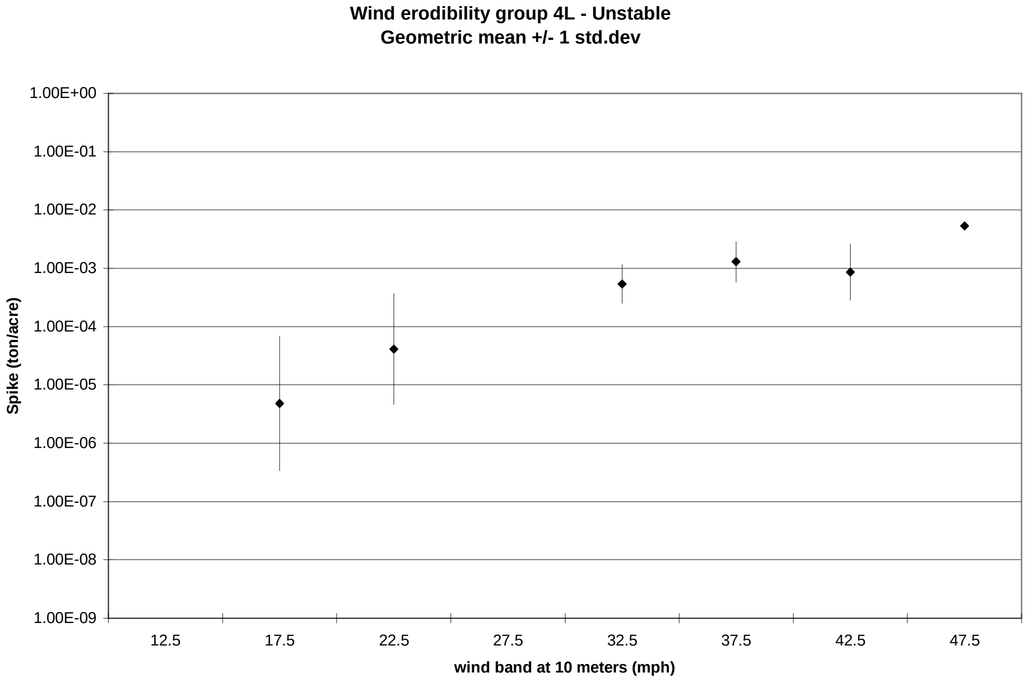
WEG 4L Stable - Spike				
wind band (mph)	**geo mean - 1 std.dev spike, ton/acre**	**geo mean spike ton/acre**	**geo mean + 1 std.dev spike, ton/acre**	**sample size, n=**
10-15	2.31E-07	3.31E-06	4.72E-05	3
15-20	2.03E-06	1.81E-05	1.61E-04	14
20-25	1.04E-05	1.18E-04	1.34E-03	9
25-30				
30-35	8.54E-05	6.10E-04	4.36E-03	9
35-40				
40-45	1.34E-04	6.51E-04	3.17E-03	6
45-50		3.88E-04		1

WEG 4L Unstable - Spike				
wind band (mph)	**geo mean - 1 std.dev spike, ton/acre**	**geo mean spike ton/acre**	**geo mean + 1 std.dev spike, ton/acre**	**sample size n=**
10-15				
15-20	5.49E-07	8.50E-06	1.32E-04	13
20-25	4.01E-05	1.21E-04	3.65E-04	11
25-30				
30-35	3.08E-04	6.96E-04	1.57E-03	9
35-40	1.03E-03	2.43E-03	5.74E-03	2
40-45	5.55E-04	1.46E-03	3.82E-03	6
45-50		6.63E-03		1

Figure 228 – Results for spike data plots of geometric means WEG 4L – stable and unstable

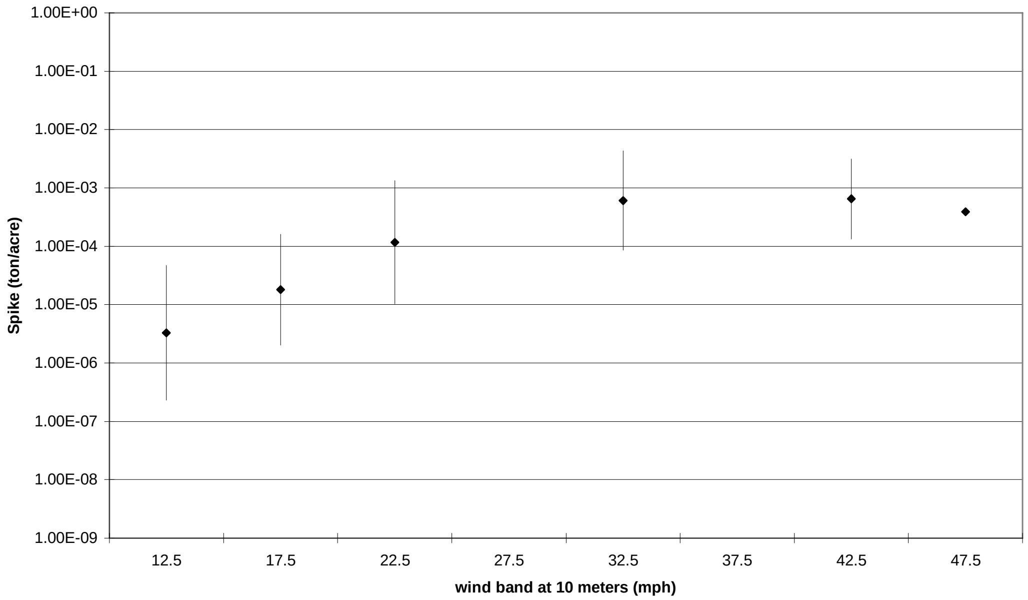
INDIVIDUAL





CUMULATIVE

Wind erodibility group 4L - stable - cumulative
Geometric mean +/- 1 std.dev



Wind erodibility group 4L - unstable - cumulative
Geometric mean +/- 1 std.dev

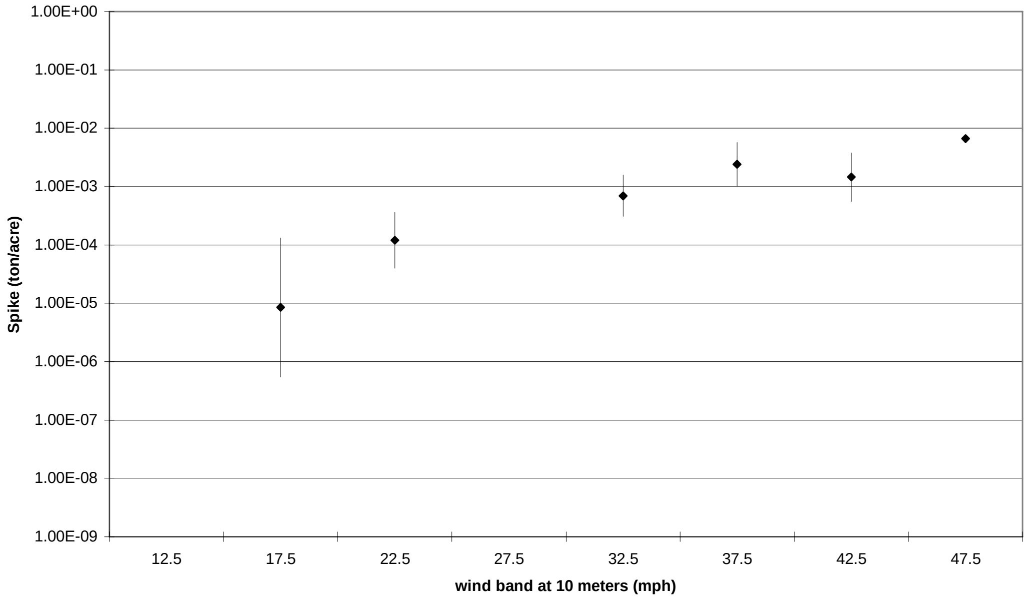


Table 40 – Summary for WEG 5 stable and unstable – spike data

INDIVIDUAL

WEG 5 Stable - Spike				
wind band (mph)	**geo mean - 1 std.dev spike, ton/acre**	**geo mean spike ton/acre**	**geo mean + 1 std.dev spike, ton/acre**	**sample size, n=**
10-15	3.19E-08	5.87E-07	1.08E-05	4
15-20	4.04E-07	2.99E-06	2.21E-05	12
20-25	6.47E-06	2.71E-05	1.14E-04	8
25-30				
30-35	1.23E-04	2.70E-04	5.94E-04	9
35-40		1.42E-04		1
40-45	3.66E-05	3.72E-04	3.78E-03	8
45-50				

WEG 5 Unstable - Spike				
wind band (mph)	**geo mean - 1 std.dev spike, ton/acre**	**geo mean spike ton/acre**	**geo mean + 1 std.dev spike, ton/acre**	**sample size n=**
10-15	1.62E-06	1.16E-05	8.33E-05	4
15-20	1.40E-07	8.66E-07	5.35E-06	11
20-25	3.17E-06	4.19E-05	5.55E-04	10
25-30				
30-35	2.43E-04	6.22E-04	1.59E-03	11
35-40				
40-45	5.50E-04	1.70E-03	5.28E-03	7
45-50				

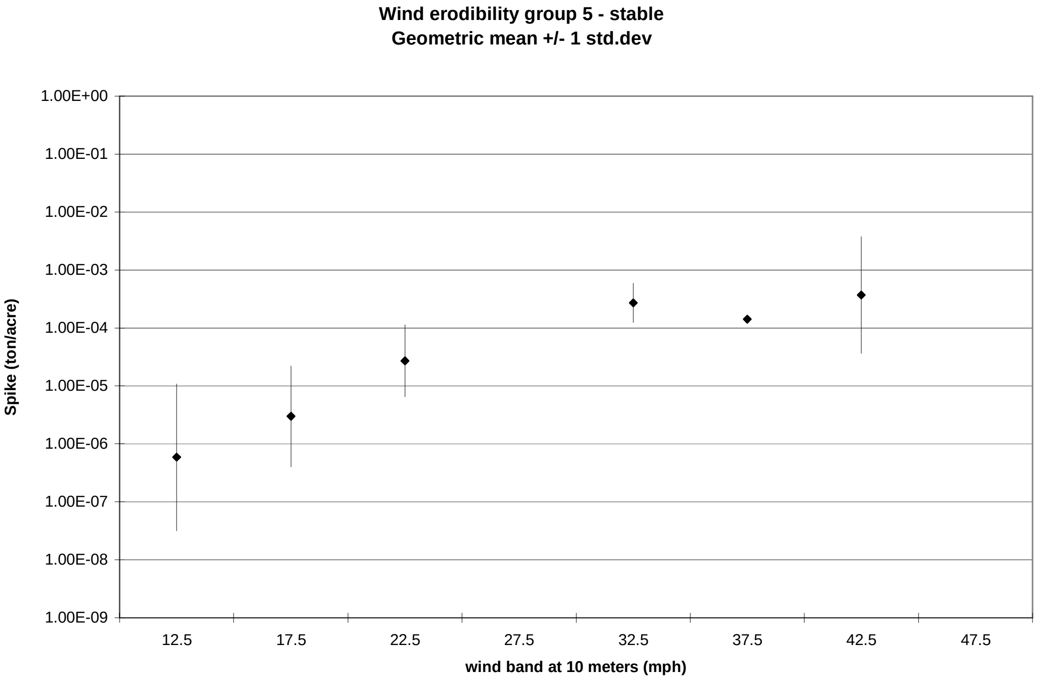
CUMULATIVE

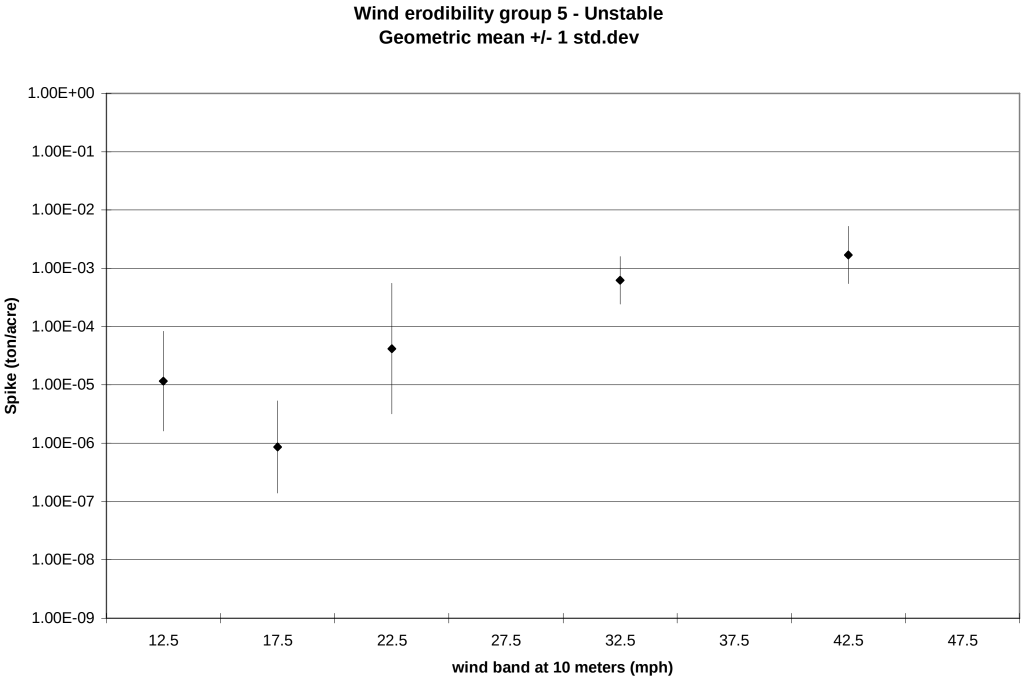
WEG 5 Stable - Spike				
wind band (mph)	geo mean - 1 std.dev spike, ton/acre	geo mean spike ton/acre	geo mean + 1 std.dev spike, ton/acre	sample size, n=
10-15	4.39E-08	1.28E-06	3.74E-05	4
15-20	2.37E-06	1.01E-05	4.34E-05	13
20-25	2.17E-05	5.06E-05	1.18E-04	9
25-30				
30-35	1.55E-04	3.30E-04	7.01E-04	9
35-40		1.27E-03		1
40-45	2.84E-04	8.89E-04	2.78E-03	8
45-50				

WEG 5 Unstable - Spike				
wind band (mph)	geo mean - 1 std.dev spike, ton/acre	geo mean spike ton/acre	geo mean + 1 std.dev spike, ton/acre	sample size n=
10-15	2.85E-06	1.80E-05	1.13E-04	4
15-20	2.10E-07	1.35E-06	8.70E-06	11
20-25	3.75E-06	4.75E-05	6.01E-04	10
25-30				
30-35	2.87E-04	9.03E-04	2.84E-03	11
35-40				
40-45	7.73E-04	2.28E-03	6.71E-03	7
45-50				

Figure 229 – Results for spike data plots of geometric means WEG 5 – stable and unstable

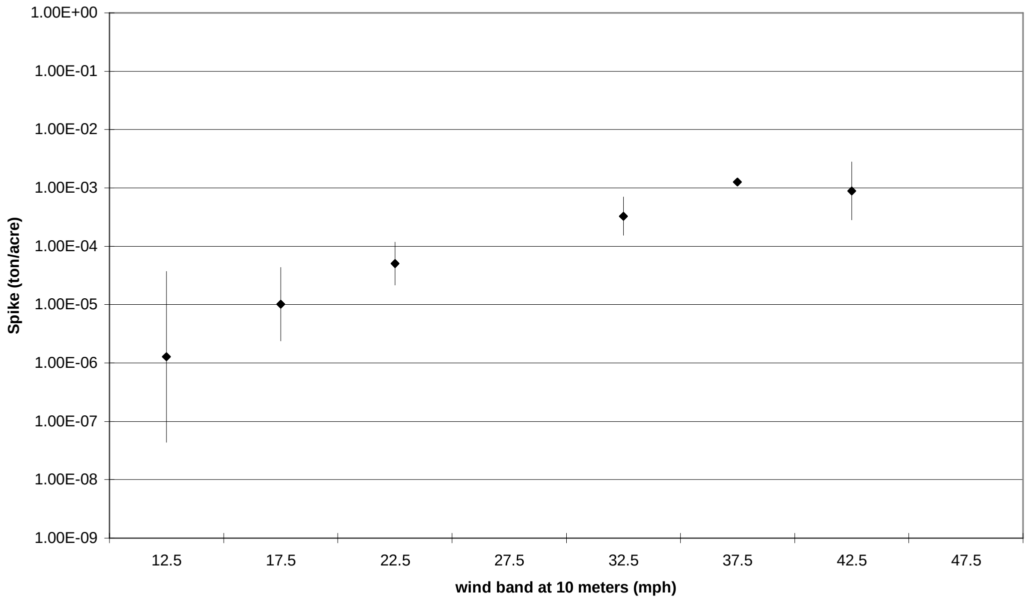
INDIVIDUAL





CUMULATIVE

Wind erodibility group 5 - stable - cumulative
Geometric mean +/- 1 std.dev



Wind erodibility group 5 - unstable - cumulative
Geometric mean +/- 1 std.dev

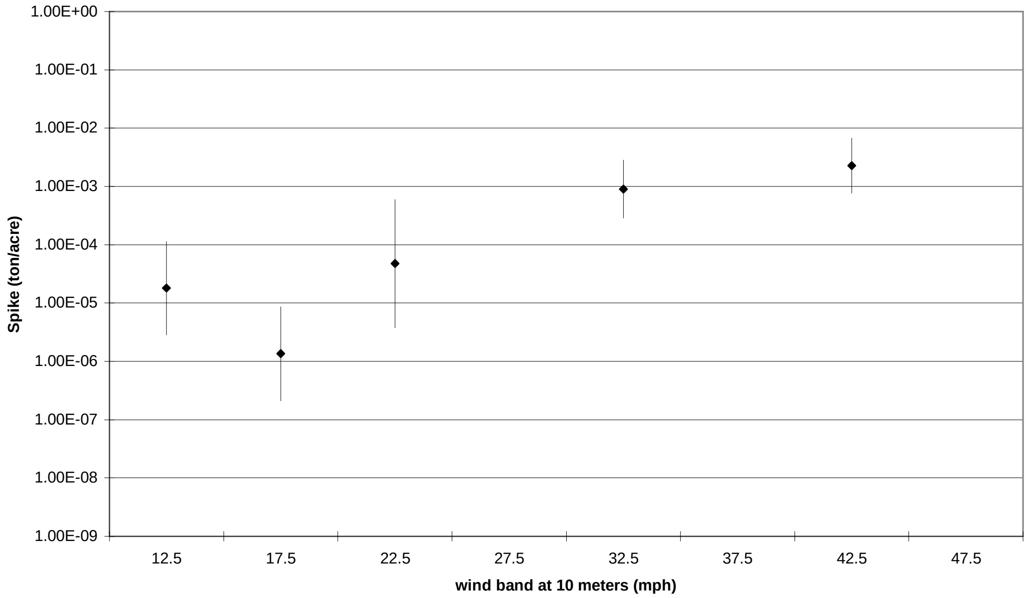


Table 41 – Summary for WEG 6 stable and unstable – spike data

INDIVIDUAL

WEG 6 Stable - Spike				
wind band (mph)	**geo mean - 1 std.dev spike, ton/acre**	**geo mean spike ton/acre**	**geo mean + 1 std.dev spike, ton/acre**	**sample size, n =**
10-15	7.88E-07	4.82E-06	2.95E-05	8
15-20	2.36E-07	2.91E-06	3.59E-05	9
20-25	5.89E-05	2.12E-04	7.64E-04	9
25-30				
30-35	2.19E-04	5.90E-04	1.59E-03	10
35-40	7.23E-05	1.74E-04	4.21E-04	4
40-45	7.62E-04	1.47E-03	2.82E-03	4
45-50				
WEG 6 Unstable - Spike				
wind band (mph)	**geo mean - 1 std.dev spike, ton/acre**	**geo mean spike ton/acre**	**geo mean + 1 std.dev spike, ton/acre**	**sample size n=**
10-15	6.17E-07	3.29E-06	1.75E-05	7
15-20	1.00E-07	6.20E-07	3.84E-06	7
20-25	5.51E-05	3.04E-04	1.68E-03	8
25-30	8.63E-04	1.75E-03	3.54E-03	2
30-35	5.98E-04	1.35E-03	3.05E-03	8
35-40	1.48E-04	1.18E-03	9.41E-03	2
40-45	5.81E-04	1.92E-03	6.35E-03	3
45-50		1.32E-03		1

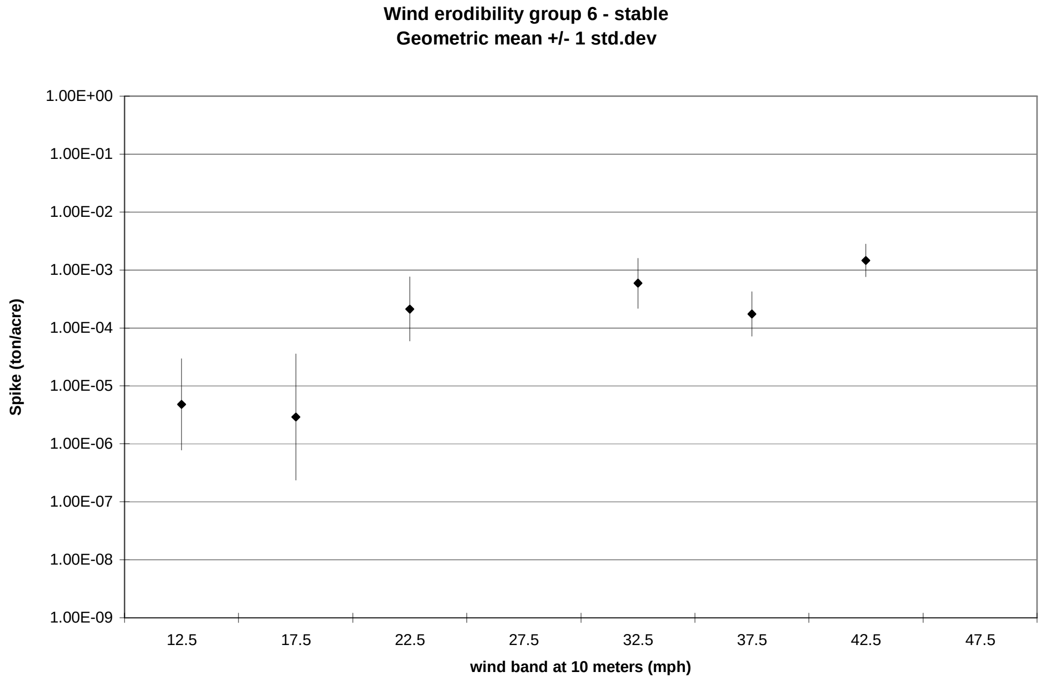
CUMULATIVE

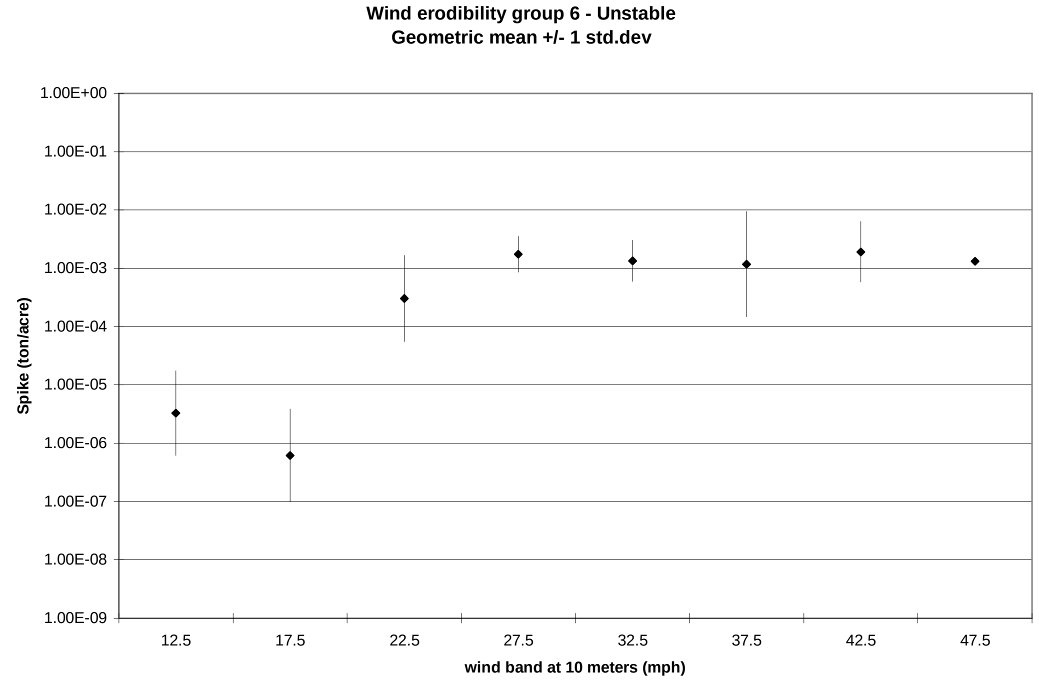
WEG 6 Stable - Spike				
wind band (mph)	**geo mean - 1 std.dev spike, ton/acre**	**geo mean spike ton/acre**	**geo mean + 1 std.dev spike, ton/acre**	**sample size, n =**
10-15	1.56E-06	8.24E-06	4.36E-05	9
15-20	4.38E-06	2.09E-05	9.94E-05	9
20-25	9.16E-05	2.67E-04	7.77E-04	9
25-30				
30-35	4.69E-04	1.04E-03	2.32E-03	10
35-40	5.92E-04	1.52E-03	3.92E-03	4
40-45	1.12E-03	2.27E-03	4.59E-03	4
45-50				

WEG 6 Unstable - Spike				
wind band (mph)	**geo mean - 1 std.dev spike, ton/acre**	**geo mean spike ton/acre**	**geo mean + 1 std.dev spike, ton/acre**	**sample size n=**
10-15	9.60E-07	5.04E-06	2.64E-05	8
15-20	1.24E-07	7.43E-07	4.45E-06	7
20-25	5.84E-05	3.17E-04	1.72E-03	8
25-30	2.05E-03	3.88E-03	7.34E-03	2
30-35	7.66E-04	2.12E-03	5.86E-03	8
35-40	1.73E-03	5.43E-03	1.70E-02	2
40-45	1.20E-03	3.23E-03	8.69E-03	3
45-50		1.86E-03		1

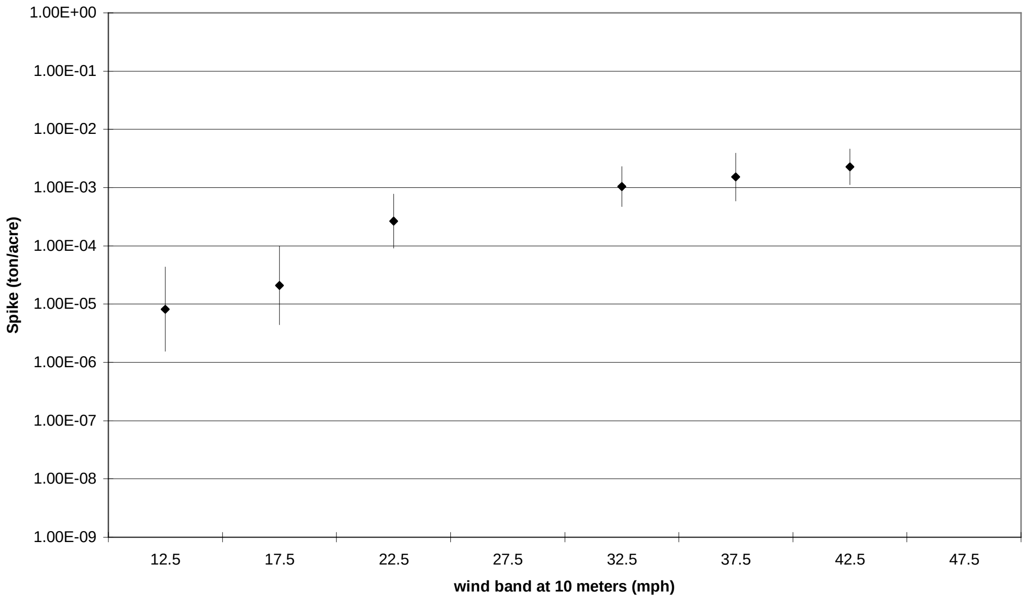
Figure 230 – Results for spike data plots of geometric means WEG 6 – stable and unstable

INDIVIDUAL

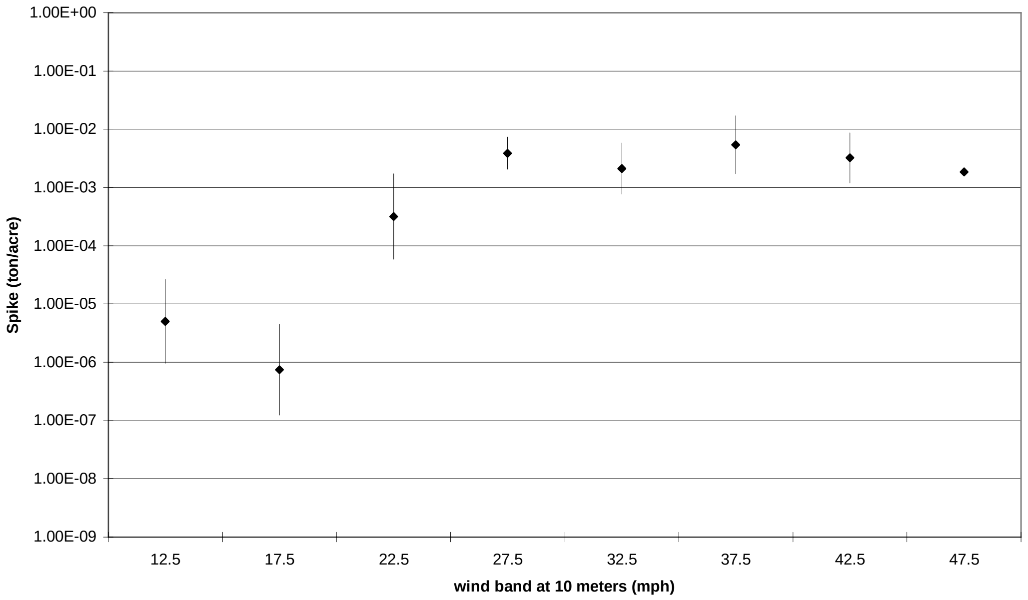




CUMULATIVE



Wind erodibility group 6 - stable - cumulative
Geometric mean +/- 1 std.dev



Wind erodibility group 6 - unstable - cumulative
Geometric mean +/- 1 std.dev

Table 42 – Summary for WEG 7 stable and unstable – spike data

INDIVIDUAL

WEG 7 Stable - Spike				
wind band (mph)	geo mean - 1 std.dev spike, ton/acre	geo mean spike ton/acre	geo mean + 1 std.dev spike, ton/acre	sample size, n=
10-15	2.08E-07	3.39E-06	5.53E-05	2
15-20	9.73E-07	7.88E-06	6.38E-05	9
20-25	1.62E-05	5.11E-05	1.61E-04	6
25-30		5.03E-04		1
30-35	5.92E-05	2.35E-04	9.30E-04	6
35-40	1.08E-06	1.39E-05	1.79E-04	3
40-45	9.62E-05	1.26E-04	1.66E-04	2
45-50				

WEG 7 Unstable - Spike				
wind band (mph)	geo mean - 1 std.dev spike, ton/acre	geo mean spike ton/acre	geo mean + 1 std.dev spike, ton/acre	sample size n=
10-15	3.15E-07	1.72E-06	9.40E-06	4
15-20	7.70E-08	1.08E-06	1.51E-05	6
20-25	1.45E-05	1.07E-04	7.85E-04	7
25-30		3.42E-03		1
30-35	4.82E-05	2.42E-04	1.21E-03	6
35-40	2.56E-04	3.92E-04	5.99E-04	2
40-45	7.66E-04	1.05E-03	1.45E-03	2
45-50		1.14E-03		1

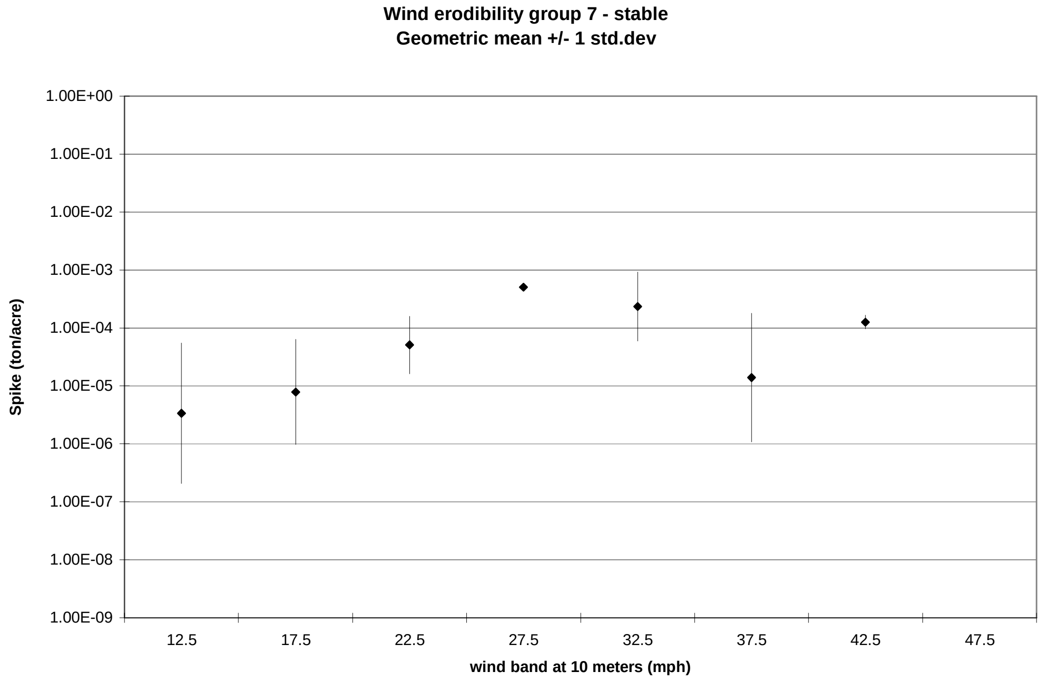
CUMULATIVE

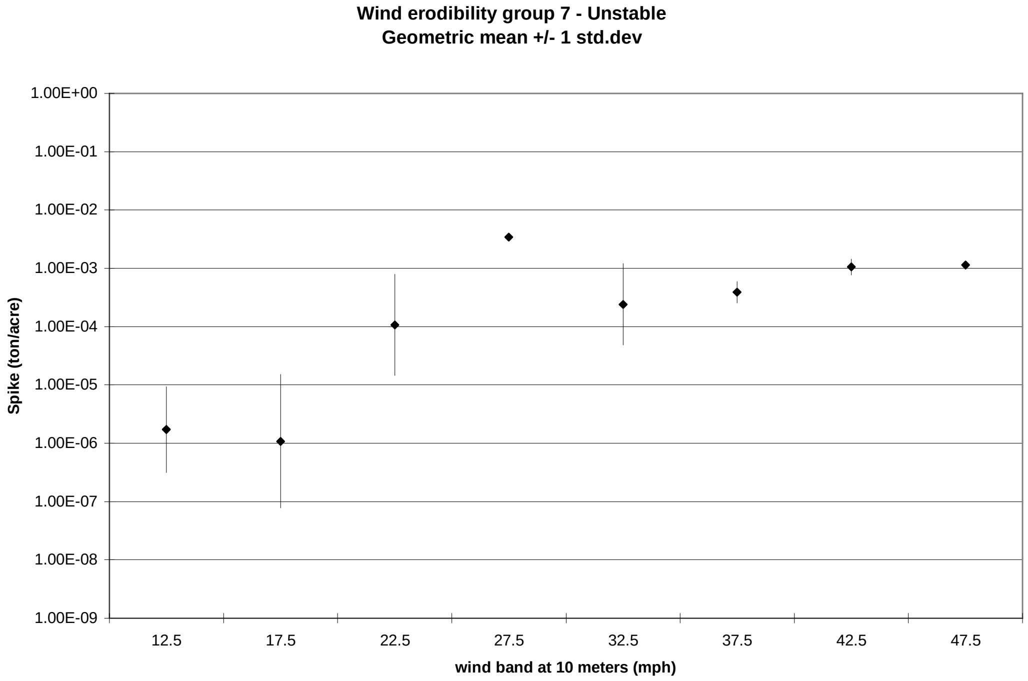
WEG 7 Stable - Spike				
wind band (mph)	**geo mean - 1 std.dev spike, ton/acre**	**geo mean spike ton/acre**	**geo mean + 1 std.dev spike, ton/acre**	**sample size, n=**
10-15	2.07E-07	3.42E-06	5.66E-05	2
15-20	8.85E-07	1.03E-05	1.21E-04	10
20-25	3.36E-05	1.00E-04	2.98E-04	6
25-30		9.93E-04		1
30-35	1.78E-04	4.99E-04	1.41E-03	6
35-40	2.59E-04	7.69E-04	2.28E-03	3
40-45	3.09E-04	3.51E-04	3.99E-04	2
45-50				

WEG 7 Unstable - Spike				
wind band (mph)	**geo mean - 1 std.dev spike, ton/acre**	**geo mean spike ton/acre**	**geo mean + 1 std.dev spike, ton/acre**	**sample size n=**
10-15	4.78E-07	2.23E-06	1.04E-05	4
15-20	1.79E-07	4.10E-06	9.39E-05	6
20-25	8.95E-06	7.97E-05	7.10E-04	8
25-30		4.30E-03		1
30-35	2.98E-04	1.06E-03	3.73E-03	6
35-40	4.41E-04	1.09E-03	2.69E-03	2
40-45	1.25E-03	1.37E-03	1.50E-03	2
45-50		1.72E-03		1

Figure 231 – Results for spike data plots of geometric means WEG 7 – stable and unstable

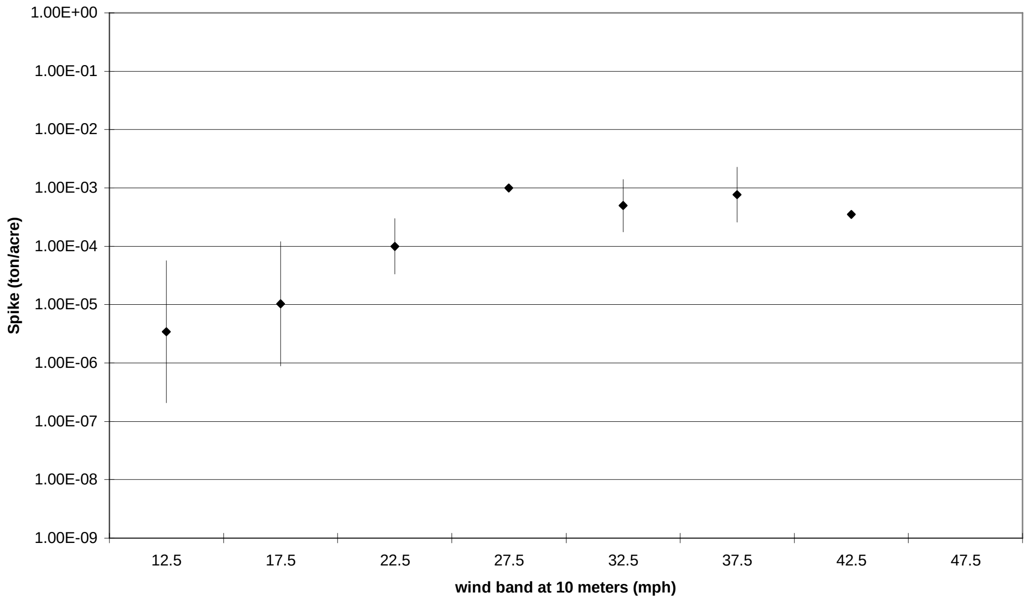
INDIVIDUAL





CUMULATIVE

Wind erodibility group 7 - stable - cumulative
Geometric mean +/- 1 std.dev



Wind erodibility group 7 - unstable - cumulative
Geometric mean +/- 1 std.dev

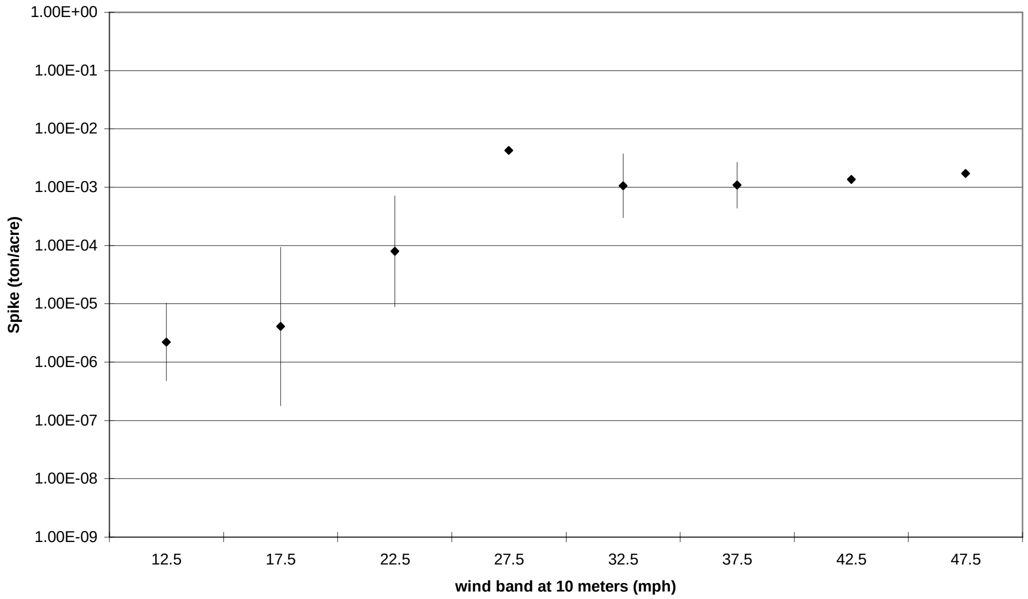


Table 43 – Summary for WEG 8 stable and unstable – spike data

INDIVIDUAL

WEG 8 Stable - Spike

wind band (mph)	geo mean - 1 std.dev spike, ton/acre	geo mean spike ton/acre	geo mean + 1 std.dev spike, ton/acre	sample size, n=
10-15	6.84E-07	2.40E-06	8.40E-06	4
15-20	9.90E-07	1.21E-05	1.48E-04	5
20-25	4.88E-06	3.07E-05	1.93E-04	6
25-30	9.22E-06	8.33E-05	7.53E-04	2
30-35	1.87E-05	1.11E-04	6.56E-04	6
35-40		2.10E-05		1
40-45		3.09E-03		1
45-50		3.81E-03		1

WEG 8 Unstable - Spike

wind band (mph)	geo mean - 1 std.dev spike, ton/acre	geo mean spike ton/acre	geo mean + 1 std.dev spike, ton/acre	sample size n=
10-15	8.53E-08	3.50E-07	1.44E-06	4
15-20		4.52E-06		1
20-25	9.14E-07	1.75E-05	3.33E-04	9
25-30				
30-35	1.19E-04	3.48E-04	1.02E-03	5
35-40	2.32E-05	5.55E-05	1.32E-04	2
40-45		1.22E-03		1
45-50	9.07E-04	2.11E-03	4.93E-03	2

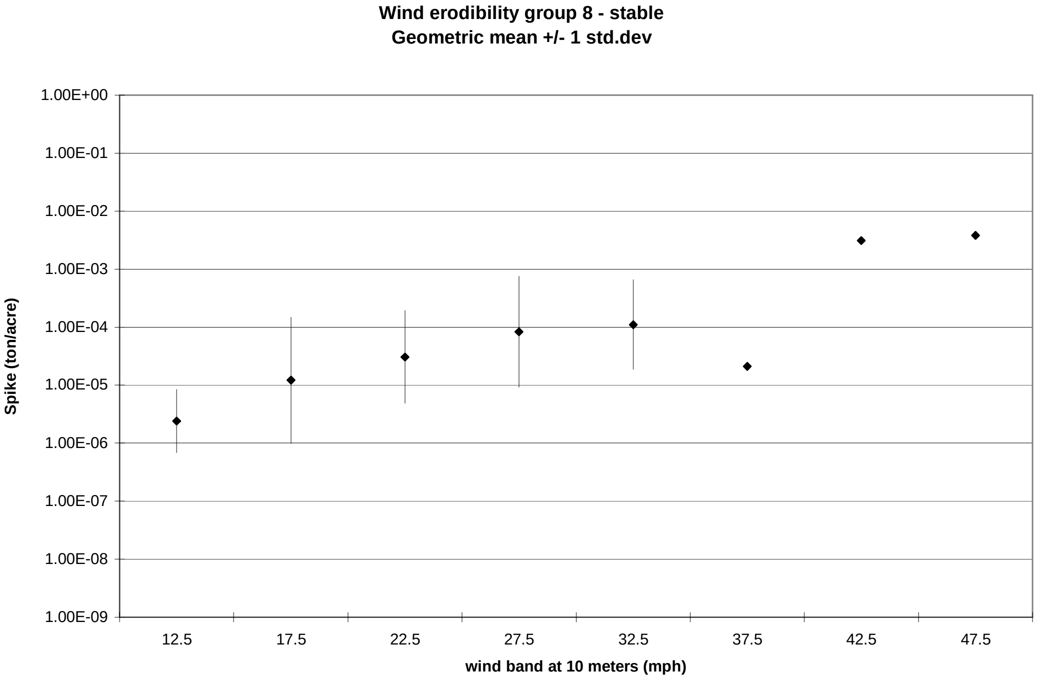
CUMULATIVE

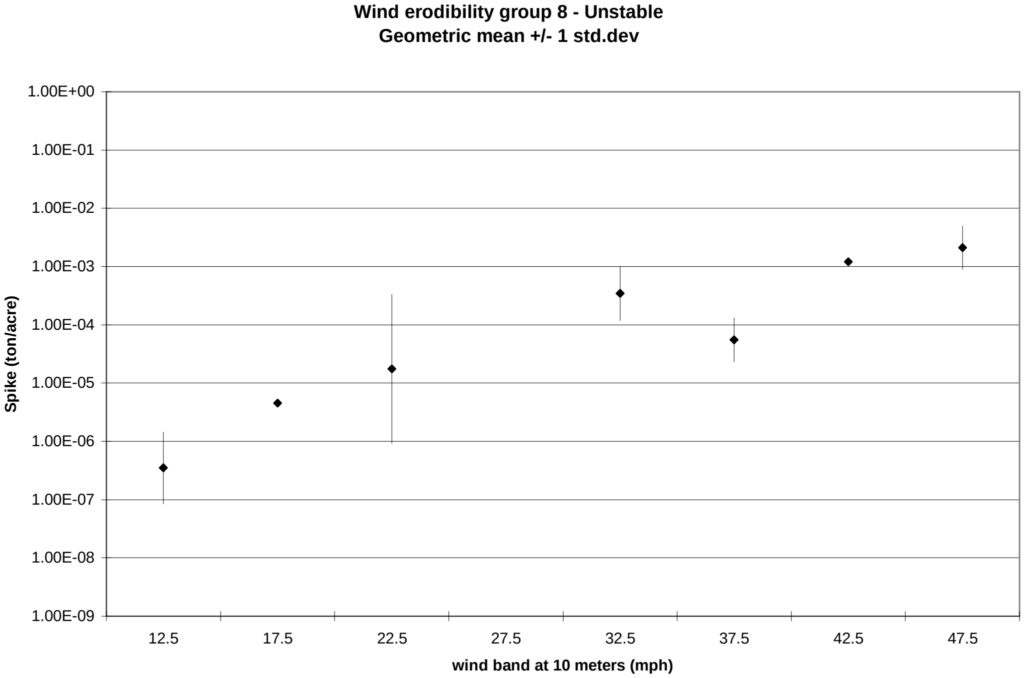
WEG 8 Stable - Spike				
wind band (mph)	geo mean - 1 std.dev spike, ton/acre	geo mean spike ton/acre	geo mean + 1 std.dev spike, ton/acre	sample size, n=
10-15	8.37E-07	3.54E-06	1.50E-05	4
15-20	4.29E-06	2.61E-05	1.59E-04	6
20-25	1.83E-05	5.52E-05	1.67E-04	8
25-30	4.91E-04	5.03E-04	5.15E-04	2
30-35	7.94E-05	2.63E-04	8.70E-04	6
35-40		1.09E-04		1
40-45		3.26E-03		1
45-50		4.88E-03		1

WEG 8 Unstable - Spike				
wind band (mph)	geo mean - 1 std.dev spike, ton/acre	geo mean spike ton/acre	geo mean + 1 std.dev spike, ton/acre	sample size n=
10-15	8.49E-08	3.81E-07	1.71E-06	4
15-20	4.52E-06	4.52E-06	4.52E-06	2
20-25	3.81E-06	3.67E-05	3.54E-04	9
25-30				
30-35	1.60E-04	4.73E-04	1.39E-03	5
35-40	4.28E-04	6.98E-04	1.14E-03	2
40-45		1.71E-03		1
45-50	9.26E-04	2.58E-03	7.17E-03	2

Figure 232 – Results for spike data plots of geometric means WEG 8 – stable and unstable

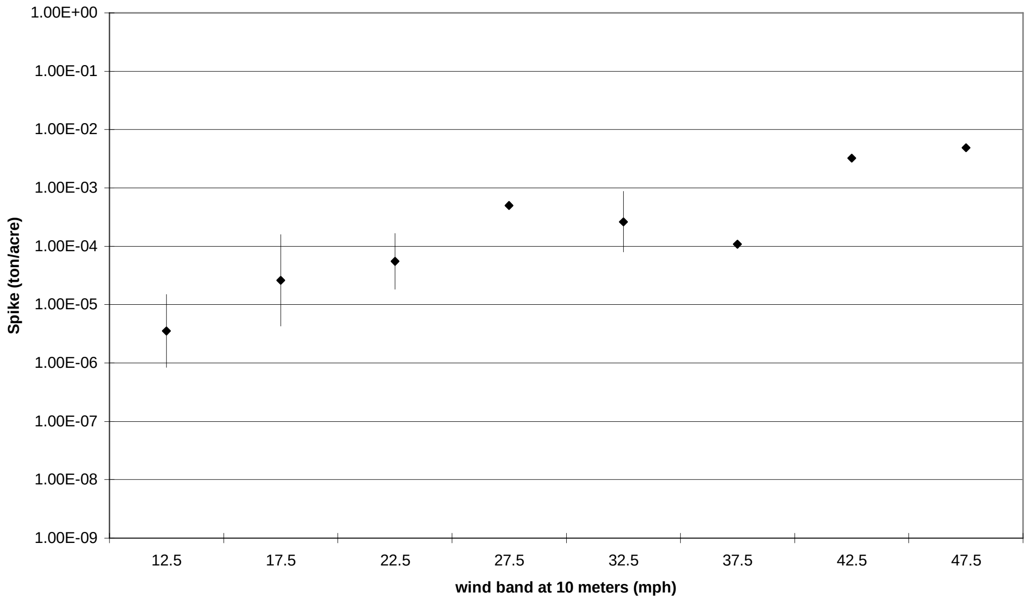
INDIVIDUAL



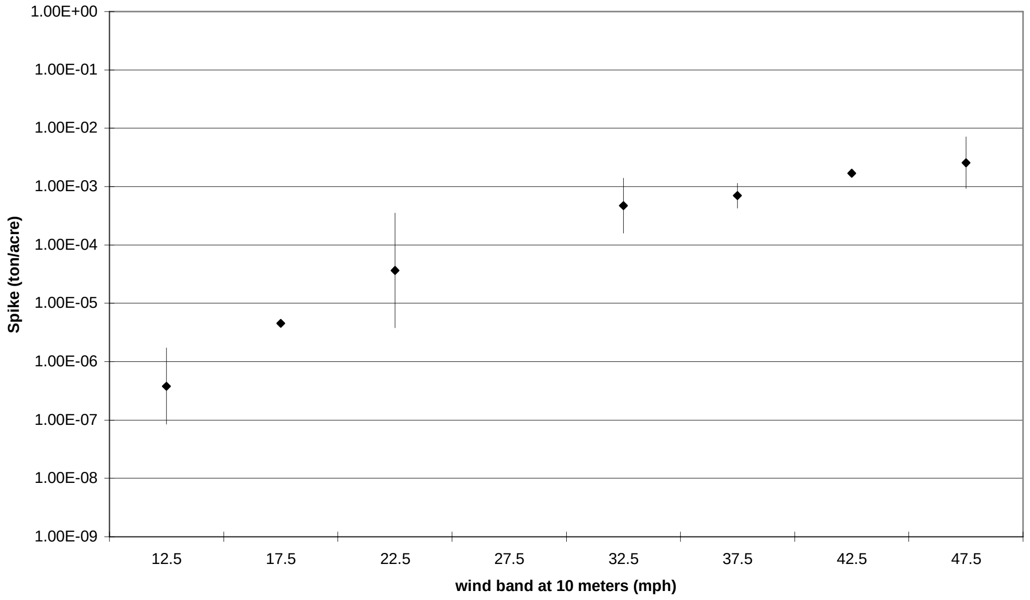


CUMULATIVE

Wind erodibility group 8 - stable - cumulative
Geometric mean +/- 1 std.dev



Wind erodibility group 8 - unstable - cumulative
Geometric mean +/- 1 std.dev



6.6 Statistical summary spike results, averaged over all Wind Erodibility Groups

Look-up tables were also generated summarizing normalized (mass per unit area) spike mass data averaged over all wind erodibility groups for both stable and unstable surface conditions. Table 44 contains the results, formatted as spike geometric mean, mean minus one standard deviation, mean plus one standard deviation, and sample size for every 5 mile per hour wind speed band. Both individual spike mass data and cumulative spike mass data are presented. Figure 233 plots the Table 44 data as normalized spike mass vs. 5 mile per hour wind speed band.

Table 44 – Summary for all Wind Erodibility Groups – spike data

INDIVIDUAL

ALL WEG Stable Spikes				
wind band (mph)	**geo mean - 1 std.dev spike ton/acre**	**geo mean spike ton/acre**	**geo mean + 1 std.dev spike ton/acre**	**sample size, n=**
10-15	4.78E-07	4.19E-06	3.68E-05	67
15-20	4.34E-07	4.04E-06	3.77E-05	91
20-25	6.53E-06	5.35E-05	4.38E-04	94
25-30	2.19E-05	8.43E-05	3.25E-04	11
30-35	6.38E-05	2.60E-04	1.06E-03	102
35-40	1.35E-05	9.30E-05	6.39E-04	33
40-45	8.94E-05	3.96E-04	1.75E-03	41
45-50	1.04E-04	8.58E-04	7.06E-03	2

ALL WEG Unstable Spikes - Individual				
wind band (mph)	**geo mean - 1 std.dev spike ton/acre**	**geo mean spike ton/acre**	**geo mean + 1 std.dev spike ton/acre**	**sample size, n=**
10-15	1.54E-09	1.05E-08	7.10E-08	62
15-20	1.39E-09	1.42E-08	1.44E-07	94
20-25	9.17E-08	6.59E-07	4.74E-06	104
25-30	4.00E-07	3.18E-06	2.53E-05	12
30-35	1.63E-06	5.09E-06	1.58E-05	96
35-40	1.04E-04	3.78E-04	1.38E-03	30
40-45	3.98E-04	1.33E-03	4.45E-03	45
45-50	9.81E-04	2.05E-03	4.28E-03	5

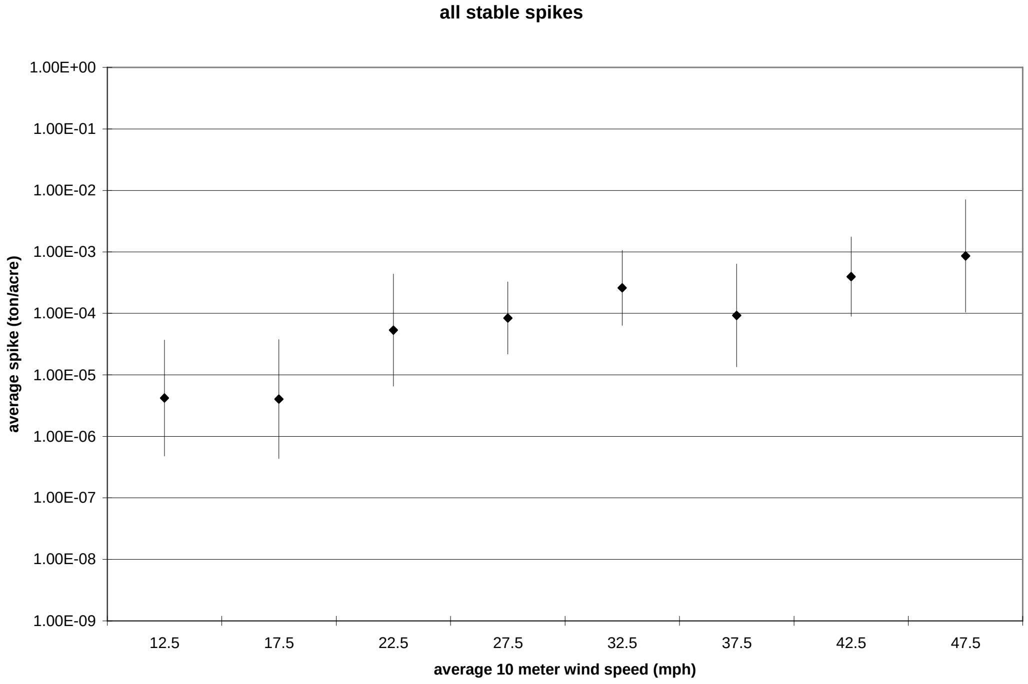
CUMULATIVE

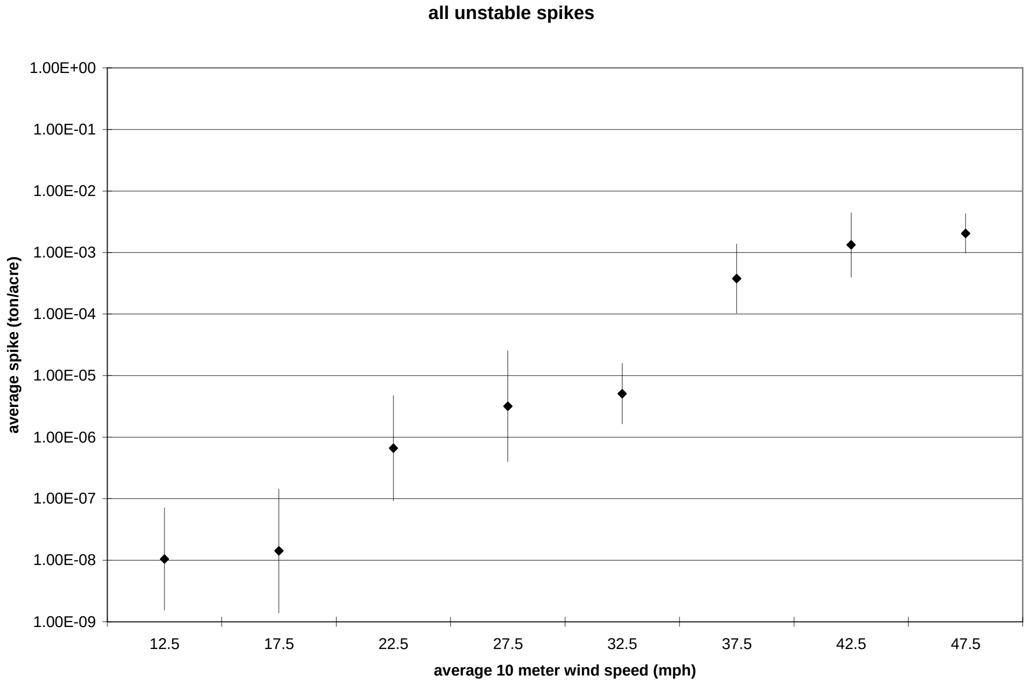
ALL WEG Stable Spikes				
wind band (mph)	geo mean - 1 std.dev spike ton/acre	geo mean spike ton/acre	geo mean + 1 std.dev spike ton/acre	sample size, n=
10-15	1.33E-06	9.44E-06	6.71E-05	75
15-20	1.16E-06	1.08E-05	1.00E-04	98
20-25	1.86E-05	9.25E-05	4.59E-04	99
25-30	3.38E-04	5.63E-04	9.38E-04	11
30-35	1.56E-04	4.96E-04	1.58E-03	103
35-40	2.16E-04	6.97E-04	2.25E-03	33
40-45	2.68E-04	7.97E-04	2.37E-03	41
45-50	2.29E-04	1.38E-03	8.25E-03	2

ALL WEG Unstable Spikes				
wind band (mph)	geo mean - 1 std.dev spike ton/acre	geo mean spike ton/acre	geo mean + 1 std.dev spike ton/acre	sample size, n=
10-15	3.88E-07	2.44E-06	1.54E-05	65
15-20	3.73E-07	3.84E-06	3.96E-05	101
20-25	2.20E-05	1.20E-04	6.56E-04	105
25-30	1.99E-04	1.04E-03	5.41E-03	12
30-35	3.95E-04	1.12E-03	3.20E-03	96
35-40	6.96E-04	1.69E-03	4.12E-03	30
40-45	7.66E-04	2.10E-03	5.73E-03	46
45-50	1.28E-03	2.69E-03	5.65E-03	5

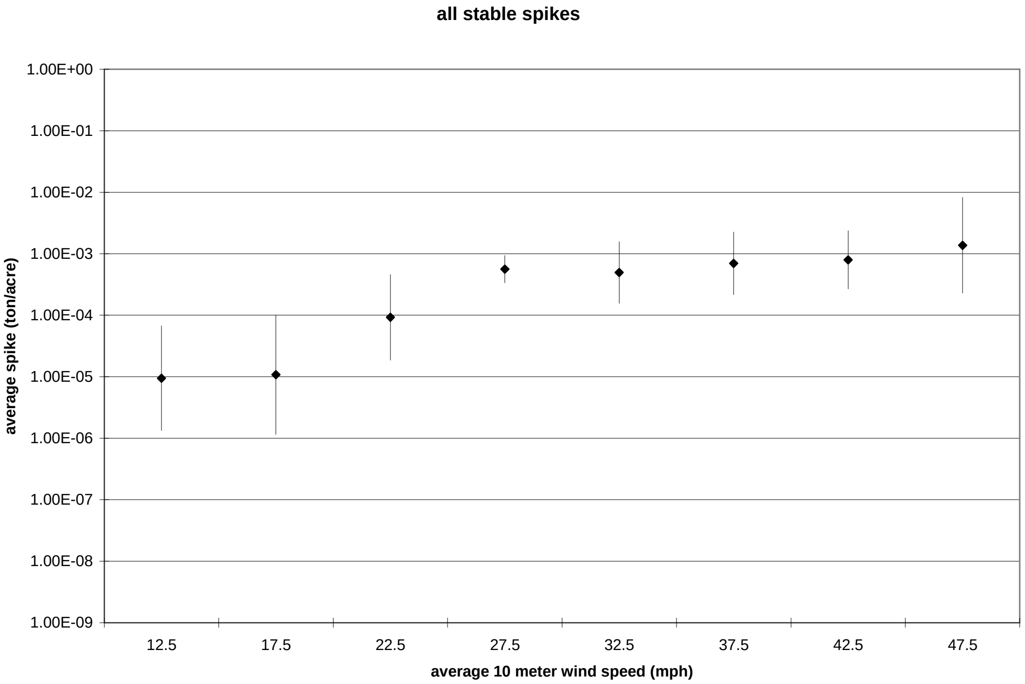
Figure 233 – Plot summary for spike data for all WEG – stable and unstable sites

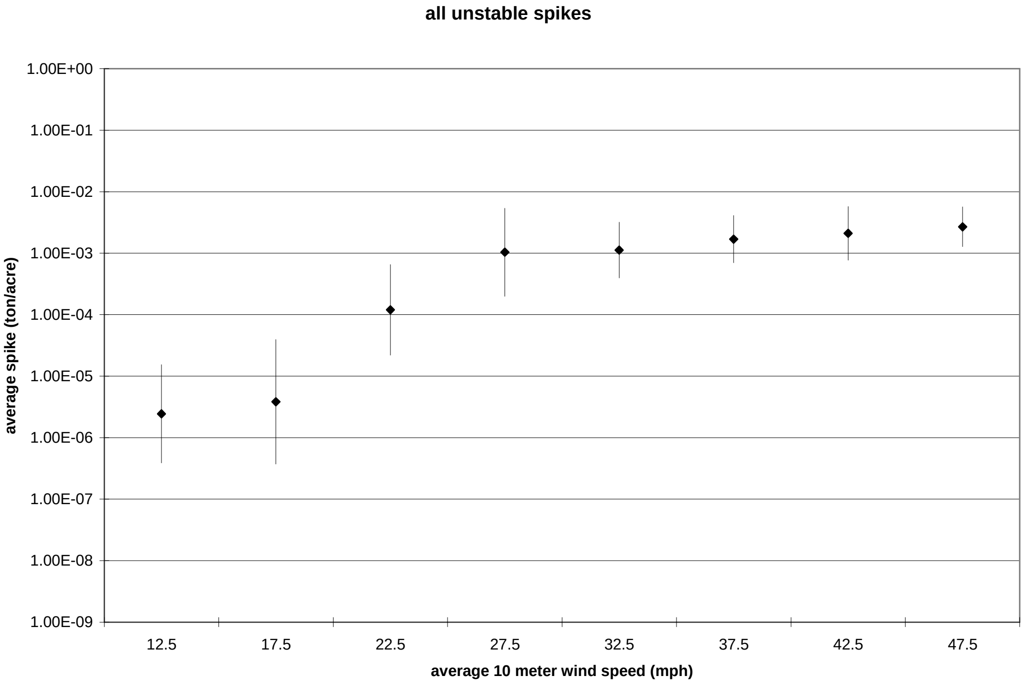
INDIVIDUAL





CUMULATIVE


all stable spikes
1.00E+00
1.00E-01
1.00E-02
1.00E-03
1.00E-04
1.00E-05
1.00E-06
1.00E-07
1.00E-08
1.00E-09
average spike (ton/acre)
12.5
17.5
22.5
27.5
32.5
37.5
42.5
47.5
average 10 meter wind speed (mph)


all unstable spikes
1.00E+00
1.00E-01
1.00E-02
1.00E-03
1.00E-04
1.00E-05
1.00E-06
1.00E-07
1.00E-08
1.00E-09
average spike (ton/acre)
12.5
17.5
22.5
27.5
32.5
37.5
42.5
47.5
average 10 meter wind speed (mph)

6.7 Comparison of 1995 and 2004 UNLV wind tunnel flux and spike results

Results of the 2004 are not strictly comparable to earlier UNLV wind tunnel studies because:

a) Many of the 78 field sites measured during the 1995 study have been built upon and are no longer vacant, and

b) Unique field and data methods were developed for this 2004 study that reduce the uncertainty of reported flux results compared to the 1995 study.

In the 2004 field study, fewer sites were studied, but were studied more intensively than in 1995. Table 45 compares the differences in site selection and measurement strategy and the net impact on the available number of records available for development of flux estimates.

Table 45 – Comparison of 1995 and 2004 site measurement strategies

Category	1995	2004	Net effect of change for 2004
Wind Erodibility Groups studied	2,3,5,6,7, 8, 9 (total of 7)	UN, 2,3,4, 4L,5,6,7, 8 (total of 9)	More wind erodibility groups studied. Add data for WEGs 4,4L, no data for WEG 9
Number of sites studied	78	32	Fewer sites per WEG in 2004
Number of runs, each site	3 total, all in same place, each at one steady velocity. 2nd run at higher velocity than 1st, 3rd run at higher velocity than 2nd.	6 total, 3 pairs of stable and unstable runs, each pair at a different location. Each run includes profiling velocity and 4 progressively increasing velocities	More data per site in 2004. 3 records per site in 1995. 5 x 6 = 30 records per site in 2004
Database size for flux calculations	237 records	911 records	More data available for generation of flux estimates

Field methods have also evolved since the 1995 study took place. Table 46 compares field methods for the 1995 and 2004 UNLV studies. For the 2004 wind tunnel study, the net impacts of the field method changes are to:

1) Reduce error associated with instrument heating through shading pressure gauges and TSI DustTraks®

2) Reduce the likelihood and intensity of tunnel seal leaks through use of standardized draft tubes.

3) Improve ability to detect fluctuations in ambient wind speed and PM-10 concentrations that could result in fluctuations in tunnel erosion velocity and PM-10 concentrations through use of a recording pressure transducer for the pitot tube (for possible wind speed effects) and through use of a second DustTrak® to simultaneously record ambient PM-10 concentrations.

4) Increase the number of unstable soil surfaces measured for PM-10 erosion through intentional soil disruption with a metal rake, and

5) Measure consistently fresh unstable surfaces (2004) compared to "as found" already weathered partially crusted unstable surfaces (1995).

Table 46 – Comparison of 1995 and 2004 field methods

Field method	1995 study	2004 study	Net impact of change for 2004 study
Erosion velocity	Fixed	Progressive, 4 stages	1) Flux estimates at more velocities, each site. 2) Mass data can't be used to establish threshold for initiation of erosion
Duration of each velocity stage	10 minutes	4 minutes, for total of 16 minutes	1) Greater reduction of available particle reservoir. 2) Spikes are larger portion of erosion signal at each velocity stage
Measure PM-10 during velocity profiling run	Not done, fans turned off at end of profile, usually 2-4 minutes	Measured PM-10 during profiling, ran fans for fixed 5 minute time period	1) Allows estimate of deflation of surface during profiling 2) Allows use of profile PM-10 concentration to estimate low velocity flux

Table 46 – Comparison of 1995 and 2004 field methods (continued)

Field method	1995 study	2004 study	Net impact of change for 2004 study
Ambient background PM-10 measurement with 2nd TSI DustTrak™	Not done. Assumed at 30 μg/m3	Measured during nearly all erosion runs, and 2/3 of profiling runs	1) Allows correction of wind tunnel PM-10 concentrations with ambient PM-10 over same time period 2) Allows correction for ambient "spikes" from vehicle or construction dust plumes
Recording of profiling pitot tube pressure pressure drop/velocity	With analog meter	With recording pressure transducer (TSI DPCalc™)	1) Allows detection of wind gusts, leaks (if compared in time to TSI DustTrak™ data) or fan failure
Seals to soil surface	Excavated soil on top of visqueen flaps	Foam seals under visqueen flaps with sand bags covering flaps	1) Reduced incidence of seal leak 2) Reduced error associated with seal leak, ingesting loose soil and increasing PM-10 readings
TSI and pressure meter shading	Unshaded; usually in full sun	Under canopy.	1) Reduced temperature excursions for DustTrak™. More likely to stay within operating temperature limits
Unstable surfaces	Measured as-found	Created intentionally with gravel rake	1) 2004 unstable surface represent "worst-case", with no time for weathering or recrusting of the exposed fines 2) 1995 unstable surfaces studied "as-found", and may have weathered or partially recrusted

Changes were also made in the methods of data reduction and analysis. These changes, along with a brief recap of major field method changes, are summarized for all four UNLV wind tunnel studies, in Table 47. The net effects of the changes in data reduction are to:

1) Correct for ambient PM-10 background in real-time over the same time interval as the PM-10 erosion data,

2) Use PM-10 erosion and PM-10 ambient background data obtained during the velocity profiling run to increase the number of flux data points available at low wind tunnel velocities,

3) Objectively process PM-10 concentration signal data to remove the initial “spike” or “microburst” of PM-10 observed in the first 5 to 90 seconds of wind tunnel operation at each wind speed increment.

4) Use recording pressure transducer data to investigate wind gusts or tunnel leaks as potential causes of unusual, mid-velocity spikes in the TSI PM-10 signals.

Table 47 – Comparison of UNLV wind tunnel PM-10 data reduction and flux calculation methods

Year	Sponsor	Tunnel seals	Tunnel velocity settings	Unstable surfaces	PM-10 ambient background measurement correction	Measurement and correction for PM-10 erosion during profile run	Erosion Threshold determination	Spike elimination method	Flux results reported as	Comment
1995	Clark County Health District	Soil on flaps	Fixed, 10 minutes. 3 velocity increments done in-place on same soil surface on same day. Velocities estimated at 10 meter height from aerodynamic roughness. Gust and leak correction not available	Sites studied as found, very few were classified as unstable	Assumed at a constant 0.030 mg/m3	Not done	Compare PM-10 flux values or soil saltation mass or cyclone mass at different velocities on each site. Look for sudden increase in mass or concentration indicating onset of sustained erosion	Subjective evaluation of slope start and slope end	Averages over 5 mph wind speed bands for individual wind erodibility groups	First field study, 78 sites, Many vacant sites now built on.. Provided stable and unstable data for 2001 SIP.

Table 47 – Comparison of UNLV wind tunnel PM-10 data reduction and flux calculation methods (continued)

Year	Sponsor	Tunnel seals	Tunnel velocity settings	Unstable surfaces	PM-10 ambient background measurement correction	Measurement and correction for PM-10 erosion during profile run?	Erosion Threshold determination	Spike elimination method	Flux results reported as	Comment
1998-1999	Multiple local agencies	Foam seals under flaps. Sand bags did not quite completely cover flaps. Used additional weights as needed.	Fixed, 10 minutes. Velocity increments done on different soil surface on different days. Velocities estimated at 10 meter height from aerodynamic roughness. Gust and leak correction not available	All sites stabilized with suppressants. Fluxes repeatedly measured over time as suppressants weathered	Assumed at a constant 0.030 mg/m3	Not done	As above	Subjective evaluation of slope start and slope end	Averages over 5 mph wind speed bands over all stable, suppressant treated soil surfaces	Dust suppressant study. Provided stabilized surface data for 2001 SIP

Table 47 – Comparison of UNLV wind tunnel PM-10 data reduction and flux calculation methods (continued)

Year	Sponsor	Tunnel seals	Tunnel velocity settings	Unstable surfaces	PM-10 ambient background measurement correction	Measurement and correction for PM-10 erosion during profile run?	Erosion Threshold determination	Spike elimination method	Flux results reported as	Comment
2003	Argonne National Labs	Foam seals under flaps. Sand bags did not quite completely cover flaps. Used additional weights as needed.	Fixed, 10 minutes (first 22 sites); Three velocity increments done at different locations on each site. Progressive: 3 velocities on 10 of the 22 sites that were revisited Three separate progressive runs each site, stable and unstable. Velocities reported as U*, friction velocity. Gust and leak correction not available	All 22 sites studied as stable, and then intentionally destabilized with gravel rake	Measured by same TSI, between erosion runs, not simultaneously. Weighted averages of background measured before and after erosion run used to correct flux data	Erosion PM-10 measured but not included as part of flux calculations	Used non-linear increase in saltation data or cyclone data, if available. If not available, used nonlinear increase in PM-10 flux	Subjective evaluation of slope start and slope end	Curve fits to cumulative fluxes reported for individual sites	Provided emission factor data to ANL for use in air quality modeling for BLM Environmental Impact Study

Table 47 – Comparison of UNLV wind tunnel PM-10 data reduction and flux calculation methods (continued)

Year	Sponsor	Tunnel seals	Tunnel velocity settings	Unstable surfaces	PM-10 ambient background measurement correction	Measurement and correction for PM-10 erosion during profile run?	Erosion Threshold determination	Spike elimination method	Flux results reported as	Comment
2004	Clark County Depart. of Air Quality Mgmt.	Foam seals under flaps. Longer sand bags used to completely cover flaps	Progressive 4 velocities; most cases at 4 minutes, each velocity stage. Velocities estimated at 10 meter height from aerodynamic roughness. Velocities continuously logged to correct for wind gusts or leaks	All 32 sites studied both as-found (stable), and then intentionally destabilized with gravel rake	Measured by 2nd TSI simultaneously with erosion runs. PM-10 background data corresponding to non-spike portion of erosion run used to correct erosion PM-10 data	Measured and included as the first, lowest erosion velocity in all flux calculations	Thresholds for initiation of PM-10 erosion not determined due to change in field methods. Net PM-10 erosion was observed at lowest possible wind tunnel velocity setting (damper wide open) during velocity profiling to obtain aerodynamic roughness, so thresholds could not be determined. Instead, a non-linear increase in PM-10 erosion rate was observed between 15-20	25-point running slope used to identify spike start and spike end.	Averages over 5 mph wind speed bands for individual wind erodibility groups	Purpose is to provide data for update to PM-10 SIP

Year	Sponsor	Tunnel seals	Tunnel velocity settings	Unstable surfaces	PM-10 ambient background measurement correction	Measurement and correction for PM-10 erosion during profile run?	Erosion Threshold determination	Spike elimination method	Flux results reported as	Comment
							mph and 25-30 mph, indicating that a wind speed of approximately 25 mph may be a suitable value for use in a Natural Events Action plan			

6.8 Effects of procedural changes from 1995 to 2004 on calculated PM-10 flux

For stable sites, comparison of the 1995 wind tunnel study flux results, averaged over all soil groups (Table 48, reported to Clark County on February 22, 2000), with the 2004 wind tunnel study results (Table 34) shows that, in general, the 2004 flux values are *higher* by a factor of 2 to 4 than the 1995 data contained in the February 22, 2000 report. In general the sample sizes used to make the flux estimates were much larger in 2004 than in 1995. Some of the data set sizes for the 5 mph wind speed bands in the 1995 study were small, and the calculated averages may not be completely representative of the entire 1995 population of emission factors that existed in southern Nevada for that soil condition. Table 48 shows 1995 stable data set sizes were less than 10 for 15-20 mph and 20-25 mph for stable surfaces. In 2004, only the stable 45-50 mph wind band had a sample size less than 10 (Table 34).

For unstable sites, comparison of the 1995 wind tunnel study to the 2004 study, averaged over all soil groups, shows that the 2004 flux values were generally *lower* than 1995 in the low wind speed bands (15-20 and 20-25 mph) and *higher* in the 25-30 mph wind speed bands and above. There may be several reasons for the higher unstable data set sizes:

> 1) Unstable sites in 2004 freshly disturbed with a rake, compared to the 1995 sites, which were tested in the as-found condition, with aged surfaces.
>
> 2) Table 48 shows 1995 unstable surface data set sizes were less than 10 for the 15-20, 20-25, 40-45, and 45-50 mph wind speed bands. In 2004, only the unstable 45-50 mph wind band had a sample size less than 10 (Table 34).

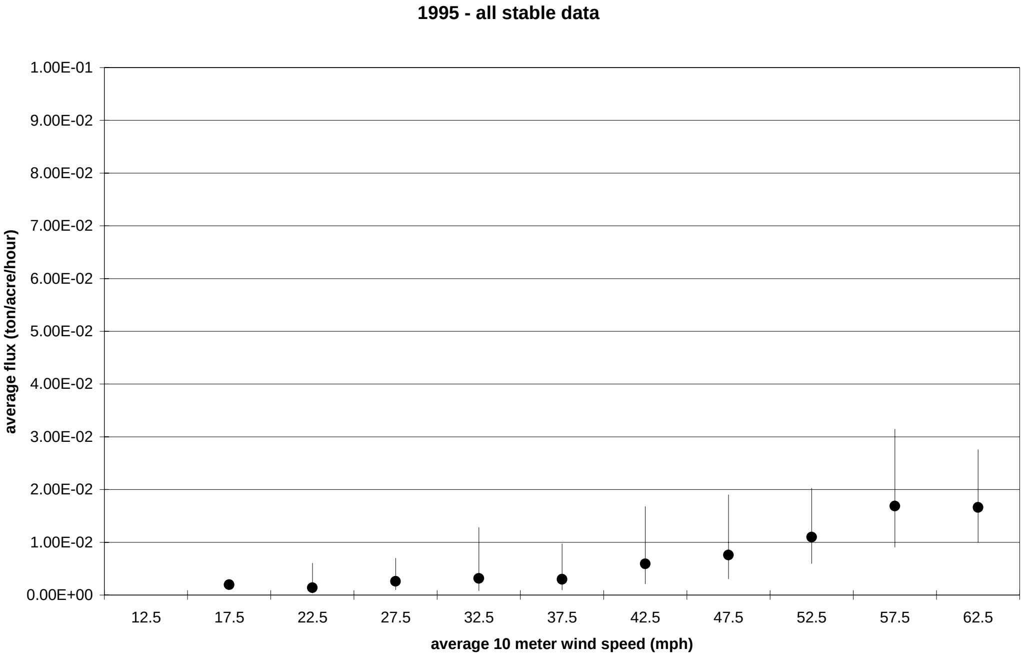
Figure 234 plots the Table 48 1995 fluxes on the same vertical scale as the Table 34 2004 fluxes shown in Figure 223.

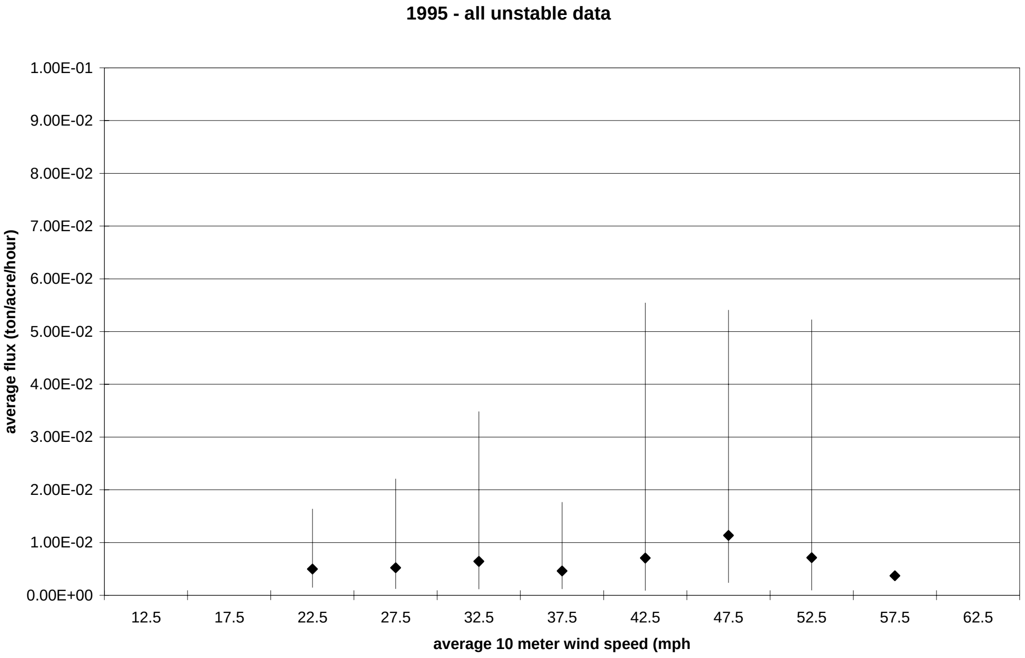
Table 48 – Summary for all Wind Erodibility Groups – 1995 flux data

ALL WEG Stable - 1995				
wind band (mph)	geo mean - 1 std.dev flux, ton/acre/hr	geo mean flux ton/acre/hr	geo mean + 1 std.dev flux, ton/acre/hr	sample size, n=
10-15				
15-20	N/A	1.95E-03	N/A	1
20-25	3.16E-04	1.38E-03	6.07E-03	4
25-30	9.46E-04	2.57E-03	7.00E-03	11
30-35	7.81E-04	3.16E-03	1.28E-02	23
35-40	9.17E-04	2.99E-03	9.73E-03	28
40-45	2.08E-03	5.92E-03	1.68E-02	34
45-50	3.02E-03	7.58E-03	1.90E-02	30
50-55	5.94E-03	1.10E-02	2.02E-02	22
55-60	9.03E-03	1.69E-02	3.15E-02	12
60-65	9.99E-03	1.66E-02	2.76E-02	4

ALL WEG Unstable -1995				
wind band (mph)	geo mean - 1 std.dev flux, ton/acre/hr	geo mean flux ton/acre/hr	geo mean + 1 std.dev flux, ton/acre/hr	sample size, n=
10-15				
15-20	1.50E-03	4.95E-03	1.63E-02	3
20-25	1.23E-03	5.21E-03	2.21E-02	4
25-30	1.18E-03	6.40E-03	3.48E-02	12
30-35	1.21E-03	4.62E-03	1.76E-02	13
35-40	8.96E-04	7.05E-03	5.54E-02	19
40-45	2.37E-03	1.13E-02	5.41E-02	9
45-50	9.71E-04	7.12E-03	5.22E-02	7
50-55	N/A	3.69E-03	N/A	1

Figure 234 – 1995 wind tunnel study, stable and unstable flux data





6.9 Effects of procedural changes from 1995 to 2004 on calculated PM-10 spike

For ***stable*** sites, comparison of the 1995 wind tunnel study cumulative spike results averaged over all soil groups (Table 49, reported to Clark County on February 22, 2000), with the 2004 cumulative spike results (Table 44) shows the 2004 spike values were lower in the 15-20, 20-25 and 40-45 mph wind bands, and similar in magnitude in the 25-30, 30-35 and 35-40 mph wind bands. For 2004, data in the 10-15 mph wind speed band (plotting point, 12.5 mph) are available; corresponding data are not available in 1995. There are stable 1995 spike data available in the 50-55, 55-60 and 60-65 wind speed bands; no comparable data are available for 2004. Sample sizes in 1995 were less than 10 for the 15-20 and 20-25 mph wind bands, so these data sets may not have been representative. A total of 163 records were used to generate the 1995 spike estimates shown in Table 49, compared to 462 records for the 2004 spike estimates in Table 44.

For ***unstable*** sites, comparison of the 1995 wind tunnel cumulative spike results averaged over all soil groups (Table 49, reported to Clark County on February 22, 2000) to the 2004 cumulative unstable spike results (Table 44), shows that, the 2004 cumulative spike values were 2.5 orders of magnitude lower than 1995 for the 15-20 mph wind bands, a factor of 2 lower than 1995 for the 25-30 mph and 35-40 mph wind bands, and were 1 order of magnitude lower for the 40-45 mph wind band. Spike masses were similar in magnitude for the 30-35 mph wind bands. Cumulative unstable spike data are similar in magnitude for 1995 and 2004. There are unstable 2004 spike data available in the 10-15 and 15-20 mph wind speed bands. No corresponding 1995 unstable spike data are available for 10-15 mph wind band and the sample sizes are very small for the 15-20 and 20-25 mph wind bands, indicating that the data sets may not be representative. A total of 56 records were used to generate the 1995 unstable spike estimates shown in Table 49, compared to 460 records for the 2004 unstable spike estimates in Table 44.

Figure 235 plots the cumulative 1995 spike data on the same vertical scale as the 2004 spikes shown in Figure 233. Standard deviations are absent from the 1995 spike mass plots for the 15-20 mph stable wind band and for the 50-55 mph unstable wind band because only one data point was available.

There are two reasons why spike values are lower in the 2004 report than in the 2000 report of 1995 data:

1) The spike separation method used for the 2004 data is based on an objective method (25 point running slope) of identifying the spike initiation and spike end. In the 1995 study, spikes were separated using visual determinations of spike start and end by inspecting for slope break in a “noisy” concentration signal. The objective method tends to produce slightly shorter spike durations and therefore smaller spike masses than visual inspection.

2) In the 1995 study (and February 22, 2000 report), a guessed background value of 30 $\mu g/m^3$ was used to correct measured wind tunnel-eroded PM-10 concentrations. Ambient PM-10 background data are available in real time in

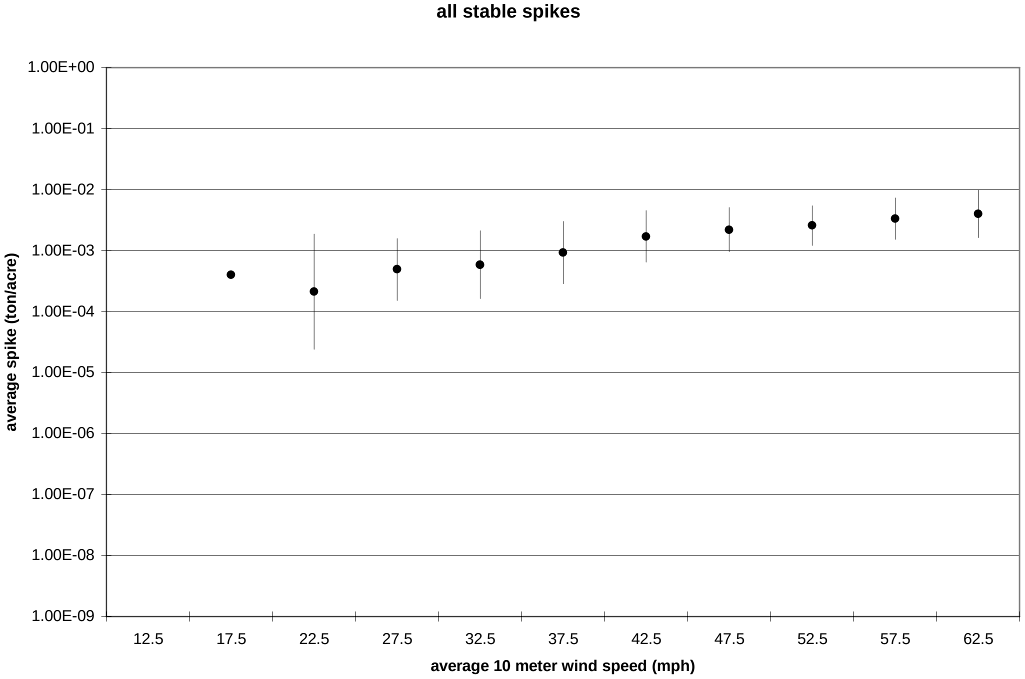
2004 to correct measured wind tunnel-eroded PM-10 concentrations that were used to calculate flux and spike values. Typical measured ambient average values were higher than 30 $\mu g/m^3$. The overall average measured ambient concentration for 2004 sites WT111 through WT135 was 93.5 $\mu g/m^3$. The overall average ambient concentration for 2004 sites WT136 through WT148 was 54 $\mu g/m^3$. These higher measured ambient values, when subtracted from the wind tunnel eroded concentrations, result in slightly lower spike masses.

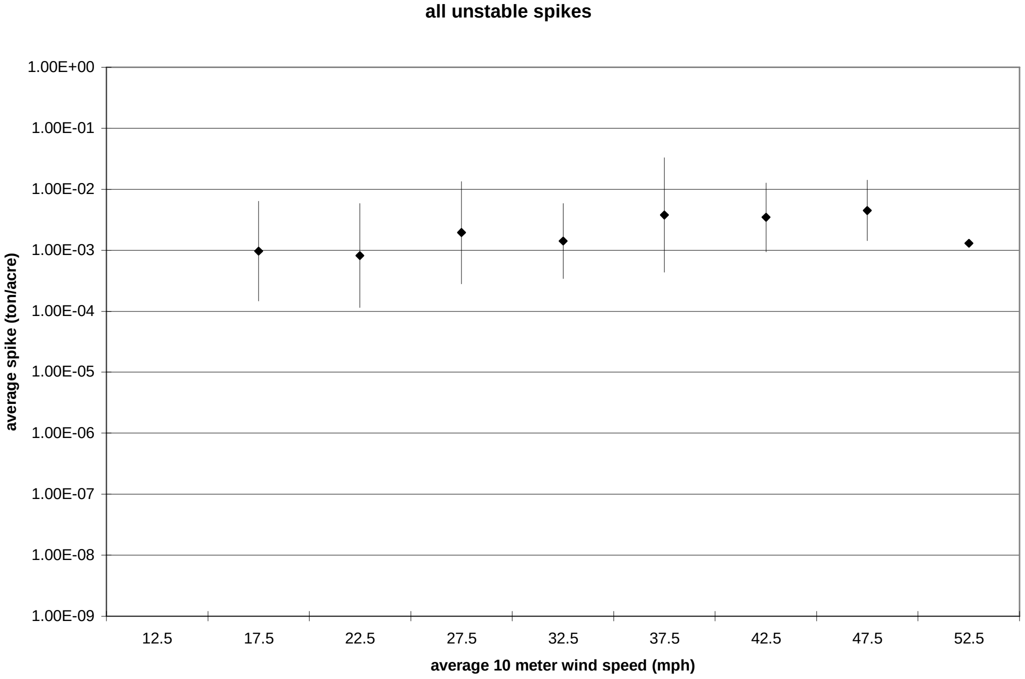
Table 49 – Summary for all Wind Erodibility Groups – 1995 cumulative spike data

ALL WEG Stable Spikes				
wind band (mph)	geo mean - 1 std.dev spike ton/acre	geo mean spike ton/acre	geo mean + 1 std.dev spike ton/acre	sample size, n=
10-15				
15-20	N/A	4.00E-04	N/A	1
20-25	2.39E-05	2.12E-04	1.88E-03	3
25-30	1.52E-04	4.90E-04	1.58E-03	10
30-35	1.62E-04	5.88E-04	2.14E-03	22
35-40	2.84E-04	9.24E-04	3.01E-03	27
40-45	6.40E-04	1.70E-03	4.53E-03	33
45-50	9.57E-04	2.20E-03	5.05E-03	29
50-55	1.21E-03	2.58E-03	5.48E-03	22
55-60	1.51E-03	3.32E-03	7.29E-03	12
60-65	1.62E-03	4.03E-03	1.00E-02	4

ALL WEG Unstable Spikes				
wind band (mph)	geo mean - 1 std.dev spike ton/acre	geo mean spike ton/acre	geo mean + 1 std.dev spike ton/acre	sample size, n=
10-15				
15-20	1.47E-04	9.65E-04	6.33E-03	3
20-25	1.14E-04	8.16E-04	5.82E-03	4
25-30	2.80E-04	1.94E-03	1.35E-02	11
30-35	3.43E-04	1.41E-03	5.82E-03	13
35-40	4.37E-04	3.80E-03	3.31E-02	11
40-45	9.40E-04	3.45E-03	1.27E-02	8
45-50	1.43E-03	4.50E-03	1.42E-02	5
50-55	N/A	1.30E-03	N/A	1

Figure 235 – 1995 wind tunnel study, stable and unstable cumulative spike data





6.10 Comparison of UNLV flux results to other studies

Table 50 compares flux data obtained from the 2004 UNLV Clark County wind tunnel study to flux results obtained from earlier studies conducted by UNLV and other research teams. The 2004 UNLV flux values cited in Table 50 are arithmetic averages of all the geometric means reported between 10 meter wind speeds of 15 and 40 mph. All non-UNLV flux values cited in Table 49 were originally cited in Chow, J.C. and J. Watson (1997), Fugitive Dust and Other Source Contributions to PM10 in Nevada's Las Vegas Valley, V II – Final Report, DRI #4039.2F1, DRI Reno NV. The 2004 UNLV flux values are closest to data reported by Nickling and Gillies (1989) for disturbed and undisturbed surfaces. The UNLV PM-10 flux data are higher than values reported by Gillette and Passi (1988), Shao et al (1993) and Stetler and Saxton (1996). Data published by other workers since 1997 should be consulted to develop a more complete comparison.

Table 50 – Comparison of flux data obtained from 2004 study to earlier studies.

Study or data source	Fugitive dust	Total Suspended Particulates (30-50 μm)	PM-10	Comment
Gillette and Passi 1988		*3.0×10^{-5} g/m²/s* 4.8×10^{-4} t/ac/hr		
Nickling & Gillies 1989 disturbed		*9.8×10^{-4} g/m²/s* 1.6×10^{-2} t/ac/hr		95% < 10 μm
Nickling & Gillies 1989 undisturbed		*1.8×10^{-4} g/m²/s* 2.9×10^{-3} t/ac/hr		95% < 10 μm
Shao et al 1993		*1.1×10^{-6} g/m²/s* 1.8×10^{-5} t/ac/hr		
AP-42 1994	*1.1×10^{-7} g/m²/s* 1.8×10^{-6} t/ac/hr			
UNLV, 1995 Unstable			*3.5×10^{-4} g/m²/s* 5.6×10^{-3} t/ac/hr	
UNLV 1995 Stable			*1.5×10^{-4} g/m²/s* 2.4×10^{-3} t/ac/hr	
Stetler & Saxton 1996 (field measurements)	*1.0×10^{-4} g/m²/s* 1.6×10^{-3} t/ac/hr			
UNLV 2004, Unstable			*9.1×10^{-4} g/m²/s* 1.5×10^{-2} t/ac/hr	
UNLV 2004, Stable			*4.4×10^{-4} g/m²/s* 7.1×10^{-3} t/ac/hr	

- **Note:** gram/square meter/second x 1.605×10^{1} = ton/acre/hour

- **Sources:** All are from literature reports cited in Chow, J.C. and J. Watson (1997), Fugitive Dust and Other Source Contributions to PM10 in Nevada's Las Vegas Valley, V II – Final Report, DRI #4039.2F1, DRI Reno NV

- Gillette, D.A. and R. Passi (1988), Modeling Dust Emission caused by wind erosion, *J. Geophys Res* 93(D11),14233-14242, as cited in Chow and Watson, 1997

- Nickling, W.G and J.A. Gillies (1989), Emission of fine-grained particulates from Desert Soils. In *Paleoclimatology and Paleometeorology:Modern and Past Patterns of Global Atmospheric Transport*, M. Leinen and M.Sarnthein, eds. Kluwer Academic Publishers, pp. 133-165, as cited in Chow and Watson, 1997

- Shao, Y. MR. Raupach, ad P.A. Findlater (1993), Effect of Saltation Bombardment on the Entrainment of Dust by the Wind, *J. Geophys Res.* 98(D7),12719-12726, as cited in Chow and Watson, 1997

- Stetler, L. and K. Saxton (1996) Earth Surface Process and Landforms, v.21, 673-685, as cited in Chow and Watson, 1997

- US EPA (1994) Compilation of Air Pollution Emission Factors (AP-42) 5th ed. US EPA, Research Triangle Park, NC, as cited in Chow and Watson, 1997

6.11 Implications for Clark County PM-10 State Implementation Plan

An Addendum to 2004 Wind Tunnel Field Study, titled *"Comparison of Vacant Lands PM-10 Emission Factors used in 2001 SIP (1995 and 1998-99 wind tunnel field studies) to 2004 Vacant Lands PM-10 Emission Factors"* was written by Dave James in June 2006 to address possible impacts of reported changes in vacant land PM-10 emission factors on PM-10 particulate emissions inventories for southern Nevada. The addendum compares:

1) Changes in reported flux stable and unstable rates from 1995 to 2004,

2) Changes in ratios of unstable to stable fluxes from 1995 to 2004,

3) How changes in the 2004 field measurement techniques eliminated velocity threshold data for 2004, compared to 1995.

To summarize the addendum's reported results:

1) 2004 reported flux rates are typically 2.5x the values reported for 1995, both stable and unstable. 2004 reported fluxes, because of their larger data set sizes, are thought to be more reliable than the 1995 data. The 2004 tend to show consistent increases from 15-20 mph to 25-30 mph, with a plateau above 25-30 pmh

2) The unstable/stable ratio for 2004 fluxes rises from a factor of 1 for the 10-15 mph and 15-20 mph wind bands to about 2 to 2.6 in the 25-30 mph wind bands and higher. The 2004 data show a much more consistent increase from low to high wind bands than do the 1995 data, probably because some of the 1995 average fluxes are computed from small sample sizes, and are less reliable than the 2004 data.

3) Velocity thresholds below which there is no measurable PM-10 erosion were not obtained in 2004. Detectable PM-10 emissions occurred at the lowest obtainable wind tunnel velocities. However, both scatter plots of all 2004 data and processed sample mean data show that, for both unstable and stable soil conditions, a 1 order of magnitude or greater increase in flux occurs when wind speeds increase from below 15 mph to above 25 mph, indicating that a 25 mph threshold may be a reasonable value for Clark County to continue to use in their Natural Events Action plan.

Appendix A – Individual site data, roughness and erosion velocities

Table 23 – Results for Z0, U* profile, and U* erosion and U 10

Date	Site	Nominal Wind Erodibility Group	Run	zo (cm)	U*profile (m/sec)	U*erosion (m/sec)	U10 (mph)
7/14/2004	WT111	5	1pS	0.027	0.283	0.283	16.6
7/14/2004	WT111	5	1aS	0.027	0.283	0.306	18.0
7/14/2004	WT111	5	1bS	0.027	0.283	0.840	25.0
7/14/2004	WT111	5	1cS	0.027	0.283	0.165	35.0
7/14/2004	WT111	5	1dS	0.027	0.283	0.273	42.6
7/14/2004	WT111	5	1pU	0.030	0.336	0.336	19.5
7/14/2004	WT111	5	1aU	0.030	0.336	0.359	20.9
7/14/2004	WT111	5	1bU	0.030	0.336	0.430	25.0
7/14/2004	WT111	5	1cU	0.030	0.336	0.601	35.0
7/14/2004	WT111	5	1dU	0.030	0.336	0.773	45.0
7/14/2004	WT111	5	2pS	0.004	0.195	0.195	13.6
7/14/2004	WT111	5	2aS	0.004	0.195	0.217	15.0
7/14/2004	WT111	5	2bS	0.004	0.195	0.362	25.0
7/14/2004	WT111	5	2cS	0.004	0.195	0.506	35.0
7/14/2004	WT111	5	2dS	0.004	0.195	0.583	40.3
7/14/2004	WT111	5	2pU	0.023	0.275	0.275	16.4
7/14/2004	WT111	5	2aU	0.023	0.275	0.284	17.0
7/14/2004	WT111	5	2bU	0.023	0.275	0.418	25.0
7/14/2004	WT111	5	2cU	0.023	0.275	0.585	35.0
7/14/2004	WT111	5	2dU	0.023	0.275	0.752	45.0
7/14/2004	WT111	5	3pS	0.018	0.293	0.293	17.9
7/14/2004	WT111	5	3aS	0.018	0.293	0.295	18.0
7/14/2004	WT111	5	3bS	0.018	0.293	0.410	25.0
7/14/2004	WT111	5	3cS	0.018	0.293	0.573	35.0
7/14/2004	WT111	5	3dS	0.018	0.293	0.737	45.0
7/14/2004	WT111	5	3pU	0.007	0.248	0.248	16.4
7/14/2004	WT111	5	3aU	0.007	0.248	0.242	16.4
7/14/2004	WT111	5	3bU	0.007	0.248	0.378	25.0
7/14/2004	WT111	5	3cU	0.007	0.248	0.530	35.0
7/14/2004	WT111	5	3dU	0.007	0.248	0.636	42.0

Appendix A (continued)

Table 23 – Results for Z_0, U^* profile, and U^* erosion and U 10

Date	Site	Nominal Wind Erodibility Group	Run	zo (cm)	U*profile (m/sec)	U*erosion (m/sec)	U10 (mph)
7/21/2004	WT113	3	1pS	0.024	0.273	0.273	16.3
7/21/2004	WT113	3	1aS	0.024	0.273	0.275	16.4
7/21/2004	WT113	3	1bS	0.024	0.273	0.420	25.0
7/21/2004	WT113	3	1cS	0.024	0.273	0.576	34.3
7/21/2004	WT113	3	1dS	0.024	0.273	0.616	36.7
7/21/2004	WT113	3	1pU	0.000	0.396	0.396	20.1
7/21/2004	WT113	3	1aU	0.000	0.396	0.394	20.1
7/21/2004	WT113	3	1bU	0.000	0.396	0.492	25.0
7/21/2004	WT113	3	1cU	0.000	0.396	0.689	35.0
7/21/2004	WT113	3	1dU	0.000	0.396	0.885	45.0
7/21/2004	WT113	3	2pS	0.257	0.435	0.435	20.1
7/21/2004	WT113	3	2aS	0.257	0.435	0.454	21.0
7/21/2004	WT113	3	2bS	0.257	0.435	0.541	25.0
7/21/2004	WT113	3	2cS	0.257	0.435	0.757	35.0
7/21/2004	WT113	3	2dS	0.257	0.435	0.974	45.0
7/21/2004	WT113	3	2pU	0.034	0.286	0.286	16.5
7/21/2004	WT113	3	2aU	0.034	0.286	0.295	17.0
7/21/2004	WT113	3	2bU	0.034	0.286	0.434	25.0
7/21/2004	WT113	3	2cU	0.034	0.286	0.608	35.0
7/21/2004	WT113	3	2dU	0.034	0.286	0.669	38.5
7/21/2004	WT113	3	3pS	0.001	0.162	0.162	12.7
7/21/2004	WT113	3	3aS	0.001	0.162	0.191	15.0
7/21/2004	WT113	3	3bS	0.001	0.162	0.318	25.0
7/21/2004	WT113	3	3cS	0.001	0.162	0.445	35.0
7/21/2004	WT113	3	3dS	0.001	0.162	0.496	39.0
7/21/2004	WT113	3	3pU	0.008	0.248	0.248	16.2
7/21/2004	WT113	3	3aU	0.008	0.248	0.260	17.0
7/21/2004	WT113	3	3bU	0.008	0.248	0.382	25.0
7/21/2004	WT113	3	3cU	0.008	0.248	0.535	35.0
7/21/2004	WT113	3	3dU	0.008	0.248	0.640	41.8

Appendix A (continued)

Table 23 – Results for Z_0, U^* profile, and U^* erosion and U 10

Date	Site	Nominal Wind Erodibility Group	Run	zo (cm)	U*profile (m/sec)	U*erosion (m/sec)	U10 (mph)
7/22/2004	WT115	7	1pS	0.013	0.258	0.258	16.0
7/22/2004	WT115	7	1aS	0.013	0.258	0.253	16.0
7/22/2004	WT115	7	1bS	0.013	0.258	0.396	25.0
7/22/2004	WT115	7	1cS	0.013	0.258	0.554	35.0
7/22/2004	WT115	7	1dS	0.013	0.258	0.686	43.3
7/22/2004	WT115	7	1pU	0.039	0.317	0.317	18.0
7/22/2004	WT115	7	1aU	0.039	0.317	0.335	19.0
7/22/2004	WT115	7	1bU	0.039	0.317	0.440	25.0
7/22/2004	WT115	7	1cU	0.039	0.317	0.636	36.1
7/22/2004	WT115	7	1dU	0.039	0.317	0.796	45.2
7/22/2004	WT115	7	2pS	0.007	0.258	0.258	17.1
7/22/2004	WT115	7	2aS	0.007	0.258	0.242	17.1
7/22/2004	WT115	7	2bS	0.007	0.258	0.378	25.0
7/22/2004	WT115	7	2cS	0.007	0.258	0.530	35.0
7/22/2004	WT115	7	2dS	0.007	0.258	0.640	42.3
7/22/2004	WT115	7	2pU	0.030	0.329	0.329	19.1
7/22/2004	WT115	7	2aU	0.030	0.329	0.326	19.1
7/22/2004	WT115	7	2bU	0.030	0.329	0.429	25.0
7/22/2004	WT115	7	2cU	0.030	0.329	0.601	35.0
7/22/2004	WT115	7	2dU	0.030	0.329	0.773	45.0
7/22/2004	WT115	7	3pS	0.004	0.224	0.224	15.5
7/22/2004	WT115	7	3aS	0.004	0.224	0.238	16.5
7/22/2004	WT115	7	3bS	0.004	0.224	0.361	25.0
7/22/2004	WT115	7	3cS	0.004	0.224	0.506	35.0
7/22/2004	WT115	7	3dS	0.004	0.224	0.561	38.8
7/22/2004	WT115	7	3pU	0.000	0.173	0.173	14.6
7/22/2004	WT115	7	3aU	0.000	0.173	0.178	15.0
7/22/2004	WT115	7	3bU	0.000	0.173	0.288	24.1
7/22/2004	WT115	7	3cU	0.000	0.173	0.372	31.3
7/22/2004	WT115	7	3dU	0.000	0.173	0.405	34.1

Appendix A (continued)

Table 23 – Results for Z_0, U^* profile, and U^* erosion and U 10

Date	Site	Nominal Wind Erodibility Group	Run	zo (cm)	U*profile (m/sec)	U*erosion (m/sec)	U10 (mph)
7/28/2004	WT116	6	1pS	0.007	0.217	0.217	14.4
7/28/2004	WT116	6	1aS	0.007	0.217	0.241	16.0
7/28/2004	WT116	6	1bS	0.007	0.217	0.377	25.0
7/28/2004	WT116	6	1cS	0.007	0.217	0.528	35.0
7/28/2004	WT116	6	1dS	0.007	0.217	0.561	37.2
7/28/2004	WT116	6	1pU	0.014	0.247	0.247	15.5
7/28/2004	WT116	6	1aU	0.014	0.247	0.249	15.6
7/28/2004	WT116	6	1bU	0.014	0.247	0.389	24.4
7/28/2004	WT116	6	1cU	0.014	0.247	0.548	34.4
7/28/2004	WT116	6	1dU	0.014	0.247	0.679	42.6
7/28/2004	WT116	6	2pS	0.009	0.215	0.215	14.0
7/28/2004	WT116	6	2aS	0.009	0.215	0.230	15.0
7/28/2004	WT116	6	2bS	0.009	0.215	0.384	25.0
7/28/2004	WT116	6	2cS	0.009	0.215	0.538	35.0
7/28/2004	WT116	6	2dS	0.009	0.215	0.611	39.8
7/28/2004	WT116	6	2pU	0.038	0.278	0.278	15.8
7/28/2004	WT116	6	2aU	0.038	0.278	0.299	17.0
7/28/2004	WT116	6	2bU	0.038	0.278	0.439	25.0
7/28/2004	WT116	6	2cU	0.038	0.278	0.615	35.0
7/28/2004	WT116	6	2dU	0.038	0.278	0.821	46.7
7/28/2004	WT116	6	3pS	0.005	0.166	0.166	11.4
7/28/2004	WT116	6	3aS	0.005	0.166	0.220	15.0
7/28/2004	WT116	6	3bS	0.005	0.166	0.366	25.0
7/28/2004	WT116	6	3cS	0.005	0.166	0.468	32.0
7/28/2004	WT116	6	3dS	0.005	0.166	0.520	35.5

Appendix A (continued)

Table 23 – Results for Z_0, U^* profile, and U^* erosion and U 10

Date	Site	Nominal Wind Erodibility Group	Run	zo (cm)	U*profile (m/sec)	U*erosion (m/sec)	U10 (mph)
7/27/2004	WT118	4.1	1pS	0.008	0.265	0.265	17.4
7/27/2004	WT118	4.1	1aS	0.008	0.265	0.238	17.4
7/27/2004	WT118	4.1	1bS	0.008	0.265	0.379	25.0
7/27/2004	WT118	4.1	1pU	0.040	0.394	0.394	22.3
7/27/2004	WT118	4.1	1aU	0.040	0.394	0.406	23.0
7/27/2004	WT118	4.1	1bU	0.040	0.394	0.441	25.0
7/27/2004	WT118	4.1	1cU	0.040	0.394	0.617	35.0
7/27/2004	WT118	4.1	1dU	0.040	0.394	0.834	47.3
7/27/2004	WT118	4.1	2pS	0.003	0.214	0.214	15.2
7/27/2004	WT118	4.1	2aS	0.003	0.214	0.221	15.0
7/27/2004	WT118	4.1	2bS	0.003	0.214	0.352	25.0
7/27/2004	WT118	4.1	2cS	0.003	0.214	0.463	32.9
7/27/2004	WT118	4.1	2dS	0.003	0.214	0.493	35.0
7/27/2004	WT118	4.1	2pU	0.013	0.291	0.291	18.3
7/27/2004	WT118	4.1	2aU	0.013	0.291	0.302	19.0
7/27/2004	WT118	4.1	2bU	0.013	0.291	0.397	25.0
7/27/2004	WT118	4.1	2cU	0.013	0.291	0.556	35.0
7/27/2004	WT118	4.1	2dU	0.013	0.291	0.623	39.2
7/27/2004	WT118	4.1	3pS	0.028	0.291	0.291	17.1
7/27/2004	WT118	4.1	3aS	0.028	0.291	0.307	18.0
7/27/2004	WT118	4.1	3bS	0.028	0.291	0.426	25.0
7/27/2004	WT118	4.1	3cS	0.028	0.291	0.596	35.0
7/27/2004	WT118	4.1	3dS	0.028	0.291	0.739	43.4
7/27/2004	WT118	4.1	3pU	0.021	0.306	0.306	18.4
7/27/2004	WT118	4.1	3aU	0.021	0.306	0.315	19.0
7/27/2004	WT118	4.1	3bU	0.021	0.306	0.420	25.0
7/27/2004	WT118	4.1	3cU	0.021	0.306	0.581	35.0
7/27/2004	WT118	4.1	3dU	0.021	0.306	0.681	41.0

Appendix A (continued)

Table 23 – Results for Z_0, U^* profile, and U^* erosion and U 10

Date	Site	Nominal Wind Erodibility Group	Run	zo (cm)	U*profile (m/sec)	U*erosion (m/sec)	U10 (mph)
8/2/2004	WT119	4.1	1pS	0.026	0.273	0.273	16.1
8/2/2004	WT119	4.1	1aS	0.026	0.273	0.339	20.0
8/2/2004	WT119	4.1	1bS	0.026	0.273	0.424	25.0
8/2/2004	WT119	4.1	1cS	0.026	0.273	0.594	35.0
8/2/2004	WT119	4.1	1dS	0.026	0.273	0.763	45.0
8/2/2004	WT119	4.1	1pU	0.026	0.288	0.288	17.0
8/2/2004	WT119	4.1	1aU	0.026	0.288	0.288	17.0
8/2/2004	WT119	4.1	1bU	0.026	0.288	0.423	25.0
8/2/2004	WT119	4.1	1cU	0.026	0.288	0.592	35.0
8/2/2004	WT119	4.1	1dU	0.026	0.288	0.761	45.0
8/2/2004	WT119	4.1	2pS	0.018	0.239	0.239	14.6
8/2/2004	WT119	4.1	2aS	0.018	0.239	0.245	15.0
8/2/2004	WT119	4.1	2bS	0.018	0.239	0.409	25.0
8/2/2004	WT119	4.1	2cS	0.018	0.239	0.573	35.0
8/2/2004	WT119	4.1	2dS	0.018	0.239	0.661	40.4
8/2/2004	WT119	4.1	2pU	0.040	0.253	0.253	14.3
8/2/2004	WT119	4.1	2aU	0.040	0.253	0.274	15.5
8/2/2004	WT119	4.1	2bU	0.040	0.253	0.442	25.0
8/2/2004	WT119	4.1	2cU	0.040	0.253	0.618	35.0
8/2/2004	WT119	4.1	2dU	0.040	0.253	0.745	42.2
8/2/2004	WT119	4.1	3pS	0.036	0.316	0.136	18.1
8/2/2004	WT119	4.1	3aS	0.036	0.316	0.349	20.0
8/2/2004	WT119	4.1	3bS	0.036	0.316	0.437	25.0
8/2/2004	WT119	4.1	3cS	0.036	0.316	0.611	35.0
8/2/2004	WT119	4.1	3dS	0.036	0.316	0.809	46.3
8/2/2004	WT119	4.1	3pU	0.016	0.279	0.279	17.3
8/2/2004	WT119	4.1	3aU	0.016	0.279	0.291	18.0
8/2/2004	WT119	4.1	3bU	0.016	0.279	0.404	25.0
8/2/2004	WT119	4.1	3cU	0.016	0.279	0.565	35.0
8/2/2004	WT119	4.1	3dU	0.016	0.279	0.703	43.5

Appendix A (continued)

Table 23 – Results for Z_0, U^* profile, and U^* erosion and U 10

Date	Site	Nominal Wind Erodibility Group	Run	zo (cm)	U*profile (m/sec)	U*erosion (m/sec)	U10 (mph)
8/3/2004	WT121	5	1pS	0.019	0.257	0.257	15.6
8/3/2004	WT121	5	1aS	0.019	0.257	0.296	18.0
8/3/2004	WT121	5	1bS	0.019	0.257	0.412	25.0
8/3/2004	WT121	5	1cS	0.019	0.257	0.576	35.0
8/3/2004	WT121	5	1dS	0.019	0.257	0.727	44.2
8/3/2004	WT121	5	1pU	0.034	0.311	0.311	17.9
8/3/2004	WT121	5	1aU	0.034	0.311	0.321	18.5
8/3/2004	WT121	5	1bU	0.034	0.311	0.434	25.0
8/3/2004	WT121	5	1cU	0.034	0.311	0.608	35.0
8/3/2004	WT121	5	1dU	0.034	0.311	0.781	45.0
8/3/2004	WT121	5	2pS	0.043	0.255	0.255	14.4
8/3/2004	WT121	5	2aS	0.043	0.255	0.286	16.1
8/3/2004	WT121	5	2bS	0.043	0.255	0.445	25.0
8/3/2004	WT121	5	2cS	0.043	0.255	0.622	35.0
8/3/2004	WT121	5	2dS	0.043	0.255	0.729	41.0
8/3/2004	WT121	5	2pU	0.026	0.281	0.281	16.6
8/3/2004	WT121	5	2aU	0.026	0.281	0.331	19.5
8/3/2004	WT121	5	2bU	0.026	0.281	0.424	25.0
8/3/2004	WT121	5	2cU	0.026	0.281	0.594	35.0
8/3/2004	WT121	5	2dU	0.026	0.281	0.694	40.9
8/3/2004	WT121	5	3pS	0.012	0.216	0.216	13.7
8/3/2004	WT121	5	3aS	0.012	0.216	0.244	15.5
8/3/2004	WT121	5	3bS	0.012	0.216	0.394	25.0
8/3/2004	WT121	5	3cS	0.012	0.216	0.536	34.0
8/3/2004	WT121	5	3dS	0.012	0.216	0.567	36.0
7/13/2004	WT121	5	3pU	0.005	0.212	0.212	14.5
8/3/2004	WT121	5	3aU	0.005	0.212	0.220	15.0
8/3/2004	WT121	5	3bU	0.005	0.212	0.367	25.0
8/3/2004	WT121	5	3cU	0.005	0.212	0.472	32.2
8/3/2004	WT121	5	3dU	0.005	0.212	0.496	33.9

Appendix A (continued)

Table 23 – Results for Z_0, U^* profile, and U^* erosion and U 10

Date	Site	Nominal Wind Erodibility Group	Run	zo (cm)	U*profile (m/sec)	U*erosion (m/sec)	U10 (mph)
7/13/2004	WT122	8	1pS	0.021	0.292	0.292	17.6
7/13/2004	WT122	8	1aS	0.021	0.292	0.156	17.6
7/13/2004	WT122	8	1bS	0.021	0.292	0.361	21.8
7/13/2004	WT122	8	1cS	0.021	0.292	0.573	34.6
7/13/2004	WT122	8	1pU	0.101	0.416	0.416	21.4
7/13/2004	WT122	8	1aU	0.101	0.416	0.381	21.4
7/13/2004	WT122	8	1bU	0.101	0.416	0.426	21.9
7/13/2004	WT122	8	1cU	0.101	0.416	0.681	35.0
7/13/2004	WT122	8	1dU	0.101	0.416	0.972	50.0
7/13/2004	WT122	8	2pS	0.027	0.320	0.320	18.9
7/13/2004	WT122	8	2aS	0.027	0.320	0.306	18.9
7/13/2004	WT122	8	2bS	0.027	0.320	0.362	21.3
7/13/2004	WT122	8	2cS	0.027	0.320	0.584	34.4
7/13/2004	WT122	8	2dS	0.027	0.320	0.803	47.3
7/13/2004	WT122	8	2pU	0.009	0.270	0.270	17.6
7/13/2004	WT122	8	2aU	0.009	0.270	0.203	17.6
7/13/2004	WT122	8	2bU	0.009	0.270	0.327	21.3
7/13/2004	WT122	8	2cU	0.009	0.270	0.513	33.4
7/13/2004	WT122	8	2dU	0.009	0.270	0.668	43.5
7/13/2004	WT122	8	3pS	0.018	0.338	0.338	20.6
7/13/2004	WT122	8	3aS	0.018	0.338	0.282	20.6
7/13/2004	WT122	8	3bS	0.018	0.338	0.329	20.1
7/13/2004	WT122	8	3cS	0.018	0.338	0.538	32.8
7/13/2004	WT122	8	3dS	0.018	0.338	0.720	43.9
7/13/2004	WT122	8	3pU	0.029	0.357	0.357	20.9
7/13/2004	WT122	8	3aU	0.029	0.357	0.295	20.9
7/13/2004	WT122	8	3bU	0.029	0.357	0.344	20.1
7/13/2004	WT122	8	3cU	0.029	0.357	0.569	33.3
7/13/2004	WT122	8	3dU	0.029	0.357	0.794	46.5

Appendix A (continued)

Table 23 – Results for Z_0, U^* profile, and U^* erosion and U 10

Date	Site	Nominal Wind Erodibility Group	Run	zo (cm)	U*profile (m/sec)	U*erosion (m/sec)	U10 (mph)
7/30/2004	WT123	5	1pS	0.012	0.242	0.242	15.3
7/30/2004	WT123	5	1aS	0.012	0.242	0.268	17.0
7/30/2004	WT123	5	1bS	0.012	0.242	0.394	25.0
7/30/2004	WT123	5	1cS	0.012	0.242	0.552	35.0
7/30/2004	WT123	5	1dS	0.012	0.242	0.693	43.9
7/30/2004	WT123	5	1pU	0.087	0.380	0.380	19.9
7/30/2004	WT123	5	1aU	0.087	0.380	0.382	20.0
7/30/2004	WT123	5	1bU	0.087	0.380	0.478	25.0
7/30/2004	WT123	5	1cU	0.087	0.380	0.669	35.0
7/30/2004	WT123	5	1dU	0.087	0.380	0.860	45.0
7/30/2004	WT123	5	2pS	0.031	0.270	0.270	15.7
7/30/2004	WT123	5	2aS	0.031	0.270	0.275	16.0
7/30/2004	WT123	5	2bS	0.031	0.270	0.430	25.0
7/30/2004	WT123	5	2cS	0.031	0.270	0.602	35.0
7/30/2004	WT123	5	2dS	0.031	0.270	0.774	45.0
7/30/2004	WT123	5	2pU	0.002	0.174	0.174	12.6
7/30/2004	WT123	5	2aU	0.002	0.174	0.208	15.0
7/30/2004	WT123	5	2bU	0.002	0.174	0.346	25.0
7/30/2004	WT123	5	2cU	0.002	0.174	0.458	33.1
7/30/2004	WT123	5	2dU	0.002	0.174	0.486	34.8
7/30/2004	WT123	5	3pS	0.029	0.302	0.302	17.6
7/30/2004	WT123	5	3aS	0.029	0.302	0.342	20.0
7/30/2004	WT123	5	3bS	0.029	0.302	0.428	25.0
7/30/2004	WT123	5	3cS	0.029	0.302	0.599	35.0
7/30/2004	WT123	5	3dS	0.029	0.302	0.770	45.0
7/30/2004	WT123	5	3pU	0.021	0.267	0.267	16.1
7/30/2004	WT123	5	3aU	0.021	0.267	0.265	16.0
7/30/2004	WT123	5	3bU	0.021	0.267	0.415	25.0
7/30/2004	WT123	5	3cU	0.021	0.267	0.581	35.0
7/30/2004	WT123	5	3dU	0.021	0.267	0.746	45.0

Appendix A (continued)

Table 23 – Results for Z_0, U^* profile, and U^* erosion and U 10

Date	Site	Nominal Wind Erodibility Group	Run	zo (cm)	U*profile (m/sec)	U*erosion (m/sec)	U10 (mph)
8/4/2004	WT124	8	1pS	0.000	0.198	0.198	16.3
8/4/2004	WT124	8	1aS	0.000	0.198	0.177	16.3
8/4/2004	WT124	8	1bS	0.000	0.198	0.303	25.0
8/4/2004	WT124	8	1cS	0.000	0.198	0.425	35.0
8/4/2004	WT124	8	1dS	0.000	0.198	0.470	38.7
8/4/2004	WT124	8	1pU	0.000	0.161	0.161	13.8
8/4/2004	WT124	8	1aU	0.000	0.161	0.175	15.0
8/4/2004	WT124	8	1bU	0.000	0.161	0.291	25.0
8/4/2004	WT124	8	1cU	0.000	0.161	0.389	33.4
8/4/2004	WT124	8	1dU	0.000	0.161	0.419	36.0
8/4/2004	WT124	8	2pS	0.004	0.166	0.166	11.6
8/4/2004	WT124	8	2aS	0.004	0.166	0.214	15.0
8/4/2004	WT124	8	2bS	0.004	0.166	0.357	25.0
8/4/2004	WT124	8	2cS	0.004	0.166	0.435	30.5
8/4/2004	WT124	8	2dS	0.004	0.166	0.478	33.5
8/4/2004	WT124	8	2pU	0.041	0.284	0.284	16.0
8/4/2004	WT124	8	3pS	0.000	0.097	0.097	11.2
8/4/2004	WT124	8	3aS	0.000	0.097	0.129	15.0
8/4/2004	WT124	8	3bS	0.000	0.097	0.215	25.0
8/4/2004	WT124	8	3cS	0.000	0.097	0.245	28.4
8/4/2004	WT124	8	3dS	0.000	0.097	0.251	29.2
8/4/2004	WT124	8	3pU	0.351	0.196	0.196	13.7
8/4/2004	WT124	8	3aU	0.351	0.196	0.214	15.0
8/4/2004	WT124	8	3bU	0.351	0.196	0.356	25.0
8/4/2004	WT124	8	3cU	0.351	0.196	0.467	32.8
8/4/2004	WT124	8	3dU	0.351	0.196	0.512	36.0

Appendix A (continued

Table 23 – Results for Z_0, U^* profile, and U^* erosion and U 10

Date	Site	Nominal Wind Erodibility Group	Run	zo (cm)	U*profile (m/sec)	U*erosion (m/sec)	U10 (mph)
8/23/2004	WT125	3	1pS	0.000	0.143	0.143	13.6
8/23/2004	WT125	3	1aS	0.000	0.143	0.056	15.0
8/23/2004	WT125	3	1bS	0.000	0.143	0.157	25.0
8/23/2004	WT125	3	1cS	0.000	0.143	0.321	30.6
8/23/2004	WT125	3	1dS	0.000	0.143	0.354	33.7
8/23/2004	WT125	3	1pU	0.006	0.221	0.221	14.8
8/23/2004	WT125	3	1aU	0.006	0.221	0.224	15.0
8/23/2004	WT125	3	1bU	0.006	0.221	0.373	25.0
8/23/2004	WT125	3	1cU	0.006	0.221	0.523	35.0
8/23/2004	WT125	3	1dU	0.006	0.221	0.611	40.9
8/23/2004	WT125	3	2pS	0.000	0.161	0.161	14.1
8/23/2004	WT125	3	2aS	0.000	0.161	0.171	15.0
8/23/2004	WT125	3	2bS	0.000	0.161	0.285	25.0
8/23/2004	WT125	3	2cS	0.000	0.161	0.364	31.9
8/23/2004	WT125	3	2dS	0.000	0.161	0.406	35.6
8/23/2004	WT125	3	2pU	0.251	0.011	0.011	16.0
8/23/2004	WT125	3	2aU	0.251	0.011	0.234	15.0
8/23/2004	WT125	3	2bU	0.251	0.011	0.390	25.0
8/23/2004	WT125	3	2cU	0.251	0.011	0.546	35.0
8/23/2004	WT125	3	2dU	0.251	0.011	0.609	39.0
8/23/2004	WT125	3	3pS	0.004	0.215	0.215	14.9
8/23/2004	WT125	3	3aS	0.004	0.215	0.217	15.0
8/23/2004	WT125	3	3bS	0.004	0.215	0.362	25.0
8/23/2004	WT125	3	3cS	0.004	0.215	0.507	31.0
8/23/2004	WT125	3	3dS	0.004	0.215	0.493	34.0
8/23/2004	WT125	3	3pU	0.040	0.325	0.325	18.4
8/23/2004	WT125	3	3aU	0.040	0.325	0.309	18.4
8/23/2004	WT125	3	3bU	0.040	0.325	0.441	25.0
8/23/2004	WT125	3	3cU	0.040	0.325	0.618	35.0
8/23/2004	WT125	3	3dU	0.040	0.325	0.794	45.0

Appendix A (continued

Table 23 – Results for Z_0, U^* profile, and U^* erosion and U 10

Date	Site	Nominal Wind Erodibility Group	Run	zo (cm)	U*profile (m/sec)	U*erosion (m/sec)	U10 (mph)
7/19/2004	WT126	2	1pS	0.000	0.168	0.168	14.3
7/19/2004	WT126	2	1aS	0.000	0.168	0.176	15.0
7/19/2004	WT126	2	1bS	0.000	0.168	0.293	25.0
7/19/2004	WT126	2	1cS	0.000	0.168	0.364	31.0
7/19/2004	WT126	2	1dS	0.000	0.168	0.384	32.7
7/19/2004	WT126	2	1pU	0.009	0.276	0.276	17.9
7/19/2004	WT126	2	1aU	0.009	0.276	0.277	18.0
7/19/2004	WT126	2	1bU	0.009	0.276	0.385	25.0
7/19/2004	WT126	2	1cU	0.009	0.276	0.539	35.0
7/19/2004	WT126	2	1dU	0.009	0.276	0.666	43.2
7/19/2004	WT126	2	2pS	0.014	0.280	0.280	17.6
7/19/2004	WT126	2	2aS	0.014	0.280	0.281	17.6
7/19/2004	WT126	2	2bS	0.014	0.280	0.100	25.8
7/19/2004	WT126	2	2cS	0.014	0.280	0.558	35.0
7/19/2004	WT126	2	2dS	0.014	0.280	0.671	42.1
7/19/2004	WT126	2	2pU	0.045	0.297	0.297	16.6
7/19/2004	WT126	2	2aU	0.045	0.297	0.304	17.0
7/19/2004	WT126	2	2bU	0.045	0.297	0.446	25.0
7/19/2004	WT126	2	2cU	0.045	0.297	0.625	35.0
7/19/2004	WT126	2	2dU	0.045	0.297	0.804	45.0
7/19/2004	WT126	2	3pS	0.002	0.196	0.196	14.4
7/19/2004	WT126	2	3aS	0.002	0.196	0.204	15.0
7/19/2004	WT126	2	3bS	0.002	0.196	0.339	25.0
7/19/2004	WT126	2	3cS	0.002	0.196	0.475	35.0
7/19/2004	WT126	2	3dS	0.002	0.196	0.493	36.3
7/19/2004	WT126	2	3pU	0.005	0.230	0.230	15.8
7/19/2004	WT126	2	3aU	0.005	0.230	0.248	17.0
7/19/2004	WT126	2	3bU	0.005	0.230	0.364	25.0
7/19/2004	WT126	2	3cU	0.005	0.230	0.510	35.0
7/19/2004	WT126	2	3dU	0.005	0.230	0.587	40.3

Appendix A (continued

Table 23 – Results for Z_0, U^* profile, and U^* erosion and U 10

Date	Site	Nominal Wind Erodibility Group	Run	zo (cm)	U*profile (m/sec)	U*erosion (m/sec)	U10 (mph)
7/15/2004	WT127	2	1pS	0.018	0.282	0.282	17.2
7/15/2004	WT127	2	1aS	0.018	0.282	0.287	17.5
7/15/2004	WT127	2	1bS	0.018	0.282	0.410	25.0
7/15/2004	WT127	2	1cS	0.018	0.282	0.573	35.0
7/15/2004	WT127	2	1dS	0.018	0.282	0.737	45.0
7/15/2004	WT127	2	1pU	0.019	0.956	0.956	18.3
7/15/2004	WT127	2	1aU	0.019	0.956	0.305	18.5
7/15/2004	WT127	2	1bU	0.019	0.956	0.412	25.0
7/15/2004	WT127	2	1cU	0.019	0.956	0.577	35.0
7/15/2004	WT127	2	1dU	0.019	0.956	0.742	45.0
7/15/2004	WT127	2	2pS	0.006	0.227	0.227	15.2
7/15/2004	WT127	2	2aS	0.006	0.227	0.254	17.0
7/15/2004	WT127	2	2bS	0.006	0.227	0.374	25.0
7/15/2004	WT127	2	2cS	0.006	0.227	0.523	35.0
7/15/2004	WT127	2	2dS	0.006	0.227	0.578	38.7
7/15/2004	WT127	2	2pU	0.033	0.369	0.369	21.2
7/15/2004	WT127	2	2aU	0.033	0.369	0.382	22.0
7/15/2004	WT127	2	2bU	0.033	0.369	0.434	25.0
7/15/2004	WT127	2	2cU	0.033	0.369	0.608	35.0
7/15/2004	WT127	2	2dU	0.033	0.369	0.782	45.0
7/15/2004	WT127	2	3pS	0.001	0.197	0.197	15.1
7/15/2004	WT127	2	3aS	0.001	0.197	0.196	15.0
7/15/2004	WT127	2	3bS	0.001	0.197	0.326	25.0
7/15/2004	WT127	2	3cS	0.001	0.197	0.454	34.8
7/15/2004	WT127	2	3dS	0.001	0.197	0.464	35.6
7/15/2004	WT127	2	3pU	0.002	0.244	0.244	18.3
7/15/2004	WT127	2	3aU	0.002	0.244	0.234	17.6
7/15/2004	WT127	2	3bU	0.002	0.244	0.334	25.0
7/15/2004	WT127	2	3cU	0.002	0.244	0.468	35.0
7/15/2004	WT127	2	3dU	0.002	0.244	0.526	39.4

Appendix A (continued)

Table 23 – Results for Z_0, U^* profile, and U^* erosion and U 10

Date	Site	Nominal Wind Erodibility Group	Run	zo (cm)	U*profile (m/sec)	U*erosion (m/sec)	U10 (mph)
8/20/2004	WT128	2	1pS	0.001	0.198	0.198	15.6
8/20/2004	WT128	2	1aS	0.001	0.198	0.193	15.6
8/20/2004	WT128	2	1bS	0.001	0.198	0.318	25.0
8/20/2004	WT128	2	1cS	0.001	0.198	0.445	35.0
8/20/2004	WT128	2	1dS	0.001	0.198	0.572	36.0
8/20/2004	WT128	2	1pU	0.001	0.184	0.184	14.1
8/20/2004	WT128	2	1aU	0.001	0.184	0.195	15.0
8/20/2004	WT128	2	1bU	0.001	0.184	0.326	25.0
8/20/2004	WT128	2	1cU	0.001	0.184	0.411	31.6
8/20/2004	WT128	2	1dU	0.001	0.184	0.456	35.0
8/20/2004	WT128	2	2pS	0.001	0.194	0.194	14.8
8/20/2004	WT128	2	2aS	0.001	0.194	0.197	15.0
8/20/2004	WT128	2	2bS	0.001	0.194	0.328	25.0
8/20/2004	WT128	2	2cS	0.001	0.194	0.396	30.2
8/20/2004	WT128	2	2dS	0.001	0.194	0.431	32.9
8/20/2004	WT128	2	2pU	0.003	0.220	0.220	15.5
8/20/2004	WT128	2	2aU	0.003	0.220	0.213	15.5
8/20/2004	WT128	2	2bU	0.003	0.220	0.355	25.0
8/20/2004	WT128	2	2cU	0.003	0.220	0.496	35.0
8/20/2004	WT128	2	2dU	0.003	0.220	0.552	38.9
8/20/2004	WT128	2	3pS	0.012	0.212	0.212	13.4
8/20/2004	WT128	2	3aS	0.012	0.212	0.237	15.0
8/20/2004	WT128	2	3bS	0.012	0.212	0.396	25.0
8/20/2004	WT128	2	3cS	0.012	0.212	0.554	35.0
8/20/2004	WT128	2	3dS	0.012	0.212	0.631	39.9
8/20/2004	WT128	2	3pU	0.002	0.207	0.207	15.1
8/20/2004	WT128	2	3aU	0.002	0.207	0.205	15.1
8/20/2004	WT128	2	3bU	0.002	0.207	0.342	25.0
8/20/2004	WT128	2	3cU	0.002	0.207	0.479	35.0
8/20/2004	WT128	2	3dU	0.002	0.207	0.520	38.1

Appendix A (continued

Table 23 – Results for Z_0, U^* profile, and U^* erosion and U 10

Date	Site	Nominal Wind Erodibility Group	Run	zo (cm)	U*profile (m/sec)	U*erosion (m/sec)	U10 (mph)
8/5/2004	WT130	3	1pS	0.035	0.310	0.310	17.8
8/5/2004	WT130	3	1aS	0.035	0.310	0.305	17.8
8/5/2004	WT130	3	1bS	0.035	0.310	0.436	25.0
8/5/2004	WT130	3	1cS	0.035	0.310	0.609	35.0
8/5/2004	WT130	3	1dS	0.035	0.310	0.783	45.0
8/5/2004	WT130	3	1pU	0.034	0.270	0.270	15.5
8/5/2004	WT130	3	1aU	0.034	0.270	0.287	16.5
8/5/2004	WT130	3	1bU	0.034	0.270	0.434	25.0
8/5/2004	WT130	3	1cU	0.034	0.270	0.608	35.0
8/5/2004	WT130	3	1dU	0.034	0.270	0.754	43.5
8/5/2004	WT130	3	2pS	0.021	0.271	0.271	16.4
8/5/2004	WT130	3	2aS	0.021	0.271	0.274	16.5
8/5/2004	WT130	3	2bS	0.021	0.271	0.415	25.0
8/5/2004	WT130	3	2cS	0.021	0.271	0.581	35.0
8/5/2004	WT130	3	2dS	0.021	0.271	0.719	43.3
8/5/2004	WT130	3	2pU	0.008	0.210	0.210	13.9
8/5/2004	WT130	3	2aU	0.008	0.210	0.228	15.0
8/5/2004	WT130	3	2bU	0.008	0.210	0.381	25.0
8/5/2004	WT130	3	2cU	0.008	0.210	0.533	35.0
8/5/2004	WT130	3	2dU	0.008	0.210	0.598	39.3
8/5/2004	WT130	3	3pS	0.006	0.219	0.219	14.7
8/5/2004	WT130	3	3aS	0.006	0.219	0.224	15.0
8/5/2004	WT130	3	3bS	0.006	0.219	0.373	25.0
8/5/2004	WT130	3	3cS	0.006	0.219	0.511	34.3
8/5/2004	WT130	3	3dS	0.006	0.219	0.539	36.2
8/5/2004	WT130	3	3pU	0.022	0.296	0.296	17.8
8/5/2004	WT130	3	3aU	0.022	0.296	0.275	17.8
8/5/2004	WT130	3	3bU	0.022	0.296	0.417	25.0
8/5/2004	WT130	3	3cU	0.022	0.296	0.583	35.0
8/5/2004	WT130	3	3dU	0.022	0.296	0.750	45.0

Appendix A (continued)

Table 23 – Results for Z_0, U^* profile, and U^* erosion and U 10

Date	Site	Nominal Wind Erodibility Group	Run	zo (cm)	U*profile (m/sec)	U*erosion (m/sec)	U10 (mph)
7/20/2004	WT131	3	1pS	0.035	0.287	0.287	16.5
7/20/2004	WT131	3	1aS	0.035	0.287	0.296	17.0
7/20/2004	WT131	3	1bS	0.035	0.287	0.435	25.0
7/20/2004	WT131	3	1cS	0.035	0.287	0.610	35.0
7/20/2004	WT131	3	1dS	0.035	0.287	0.784	45.0
7/20/2004	WT131	3	1pU	0.025	0.233	0.233	13.8
7/20/2004	WT131	3	1aU	0.025	0.233	0.253	15.0
7/20/2004	WT131	3	1bU	0.025	0.233	0.421	25.0
7/20/2004	WT131	3	1cU	0.025	0.233	0.590	35.0
7/20/2004	WT131	3	1dU	0.025	0.233	0.639	37.9
7/20/2004	WT131	3	2pS	0.027	0.296	0.296	17.4
7/20/2004	WT131	3	2aS	0.027	0.296	0.306	18.0
7/20/2004	WT131	3	2bS	0.027	0.296	0.426	25.0
7/20/2004	WT131	3	2cS	0.027	0.296	0.596	35.0
7/20/2004	WT131	3	2dS	0.027	0.296	0.735	43.2
7/20/2004	WT131	3	2pU	0.055	0.304	0.304	16.7
7/20/2004	WT131	3	2aU	0.055	0.304	0.328	18.0
7/20/2004	WT131	3	2bU	0.055	0.304	0.456	25.0
7/20/2004	WT131	3	2cU	0.055	0.304	0.638	35.0
7/20/2004	WT131	3	2dU	0.055	0.304	0.820	45.0
7/20/2004	WT131	3	3pS	0.013	0.263	0.263	16.5
7/20/2004	WT131	3	3aS	0.013	0.263	0.271	17.0
7/20/2004	WT131	3	3bS	0.013	0.263	0.398	25.0
7/20/2004	WT131	3	3cS	0.013	0.263	0.557	35.0
7/20/2004	WT131	3	3dS	0.013	0.263	0.647	40.6
7/20/2004	WT131	3	3pU	0.038	0.320	0.320	18.2
7/20/2004	WT131	3	3aU	0.038	0.320	0.333	19.0
7/20/2004	WT131	3	3bU	0.038	0.320	0.439	25.0
7/20/2004	WT131	3	3cU	0.038	0.320	0.614	35.0
7/20/2004	WT131	3	3dU	0.038	0.320	0.786	44.8

Appendix A (continued)

Table 23 – Results for Z_0, U^* profile, and U^* erosion and U 10

Date	Site	Nominal Wind Erodibility Group	Run	zo (cm)	U*profile (m/sec)	U*erosion (m/sec)	U10 (mph)
8/6/2004	WT132	4.1	1pS	0.012	0.223	0.223	15.9
8/6/2004	WT132	4.1	1aS	0.012	0.223	0.046	18.0
8/6/2004	WT132	4.1	1bS	0.012	0.223	0.089	25.0
8/6/2004	WT132	4.1	1cS	0.012	0.223	0.175	35.0
8/6/2004	WT132	4.1	1dS	0.012	0.223	0.718	42.7
8/6/2004	WT132	4.1	1pU	0.062	0.342	0.342	18.5
8/6/2004	WT132	4.1	1aU	0.062	0.342	0.354	18.5
8/6/2004	WT132	4.1	1bU	0.062	0.342	0.462	25.0
8/6/2004	WT132	4.1	1cU	0.062	0.342	0.645	35.0
8/6/2004	WT132	4.1	1dU	0.062	0.342	0.831	45.0
8/6/2004	WT132	4.1	2pS	0.012	0.287	0.287	18.2
8/6/2004	WT132	4.1	2aS	0.012	0.287	0.267	18.2
8/6/2004	WT132	4.1	2bS	0.012	0.287	0.393	25.0
8/6/2004	WT132	4.1	2cS	0.012	0.287	0.550	35.0
8/6/2004	WT132	4.1	2dS	0.012	0.287	0.707	45.0
8/6/2004	WT132	4.1	2pU	0.013	0.288	0.288	18.2
8/6/2004	WT132	4.1	2aU	0.013	0.288	0.317	20.0
8/6/2004	WT132	4.1	2bU	0.013	0.288	0.396	25.0
8/6/2004	WT132	4.1	2cU	0.013	0.288	0.555	35.0
8/6/2004	WT132	4.1	2dU	0.013	0.288	0.375	42.6
8/6/2004	WT132	4.1	3pS	0.048	0.298	0.298	16.6
8/6/2004	WT132	4.1	3aS	0.048	0.298	0.306	17.0
8/6/2004	WT132	4.1	3bS	0.048	0.298	0.450	25.0
8/6/2004	WT132	4.1	3cS	0.048	0.298	0.630	35.0
8/6/2004	WT132	4.1	3dS	0.048	0.298	0.810	45.0
8/6/2004	WT132	4.1	3pU	0.003	0.241	0.241	17.0
8/6/2004	WT132	4.1	3aU	0.003	0.241	0.235	16.5
8/6/2004	WT132	4.1	3bU	0.003	0.241	0.356	25.0
8/6/2004	WT132	4.1	3cU	0.003	0.241	0.498	35.0
8/6/2004	WT132	4.1	3dU	0.003	0.241	0.542	38.1

Appendix A (continued

Table 23 – Results for Z_0, U^* profile, and U^* erosion and U 10

Date	Site	Nominal Wind Erodibility Group	Run	zo (cm)	U*profile (m/sec)	U*erosion (m/sec)	U10 (mph)
7/26/2004	WT133	7	1pS	0.000	0.119	0.119	10.3
7/26/2004	WT133	7	1aS	0.000	0.119	0.172	15.0
7/26/2004	WT133	7	1bS	0.000	0.119	0.287	25.0
7/26/2004	WT133	7	1cS	0.000	0.119	0.338	29.5
7/26/2004	WT133	7	1dS	0.000	0.119	0.358	31.2
7/26/2004	WT133	7	1pU	0.002	0.201	0.201	14.8
7/26/2004	WT133	7	1aU	0.002	0.201	0.204	15.0
7/26/2004	WT133	7	1bU	0.002	0.201	0.340	25.0
7/26/2004	WT133	7	1cU	0.002	0.201	0.394	29.0
7/26/2004	WT133	7	1dU	0.002	0.201	0.458	33.7
7/26/2004	WT133	7	2pS	0.098	0.249	0.249	16.1
7/26/2004	WT133	7	2aS	0.098	0.249	0.248	16.1
7/26/2004	WT133	7	2bS	0.098	0.249	0.387	25.0
7/26/2004	WT133	7	2cS	0.098	0.249	0.542	35.0
7/26/2004	WT133	7	2dS	0.098	0.249	0.604	39.0
7/26/2004	WT133	7	2pU	0.000	0.185	0.185	15.9
7/26/2004	WT133	7	2aU	0.000	0.185	0.186	16.0
7/26/2004	WT133	7	2bU	0.000	0.185	0.291	25.0
7/26/2004	WT133	7	2cU	0.000	0.185	0.369	31.7
7/26/2004	WT133	7	2dU	0.000	0.185	0.410	35.2
7/26/2004	WT133	7	3pS	0.001	0.217	0.217	17.5
7/26/2004	WT133	7	3aS	0.001	0.217	0.195	17.5
7/26/2004	WT133	7	3bS	0.001	0.217	0.309	25.0
7/26/2004	WT133	7	3cS	0.001	0.217	0.417	33.8
7/26/2004	WT133	7	3dS	0.001	0.217	0.469	38.0
7/26/2004	WT133	7	3pU	0.047	0.371	0.371	20.7
7/26/2004	WT133	7	3aU	0.047	0.371	0.376	21.0
7/26/2004	WT133	7	3bU	0.047	0.371	0.448	25.0
7/26/2004	WT133	7	3cU	0.047	0.371	0.627	35.0
7/26/2004	WT133	7	3dU	0.047	0.371	0.783	43.7

Appendix A (continued)

Table 23 – Results for Z_0, U^* profile, and U^* erosion and U 10

Date	Site	Nominal Wind erodibility Group	Run	zo (cm)	U*profile (m/sec)	U*erosion (m/sec)	U10 (mph)
7/12/2004	WT134	4	1pS	0.000	0.179	0.179	14.7
7/12/2004	WT134	4	1aS	0.000	0.179	0.180	14.7
7/12/2004	WT134	4	1bS	0.000	0.179	0.257	21.2
7/12/2004	WT134	4	1cS	0.000	0.179	0.320	26.4
7/12/2004	WT134	4	1dS	0.000	0.179	0.438	36.2
7/12/2004	WT134	4	1pU	0.015	0.297	0.297	18.5
7/12/2004	WT134	4	1aU	0.015	0.297	0.259	18.5
7/12/2004	WT134	4	1bU	0.015	0.297	0.342	21.2
7/12/2004	WT134	4	1cU	0.015	0.297	0.442	27.4
7/12/2004	WT134	4	1dU	0.015	0.297	0.643	39.9
7/12/2004	WT134	4	2pS	0.000	0.166	0.166	14.6
7/12/2004	WT134	4	2aS	0.000	0.166	0.167	14.7
7/12/2004	WT134	4	2bS	0.000	0.166	0.234	20.9
7/12/2004	WT134	4	2cS	0.000	0.166	0.295	26.0
7/12/2004	WT134	4	2dS	0.000	0.166	0.411	36.2
7/12/2004	WT134	4	2pU	0.013	0.263	0.263	16.6
7/12/2004	WT134	4	2aU	0.013	0.263	0.271	17.1
7/12/2004	WT134	4	2bU	0.013	0.263	0.350	22.1
7/12/2004	WT134	4	2cU	0.013	0.263	0.116	28.3
7/12/2004	WT134	4	2dU	0.013	0.263	0.239	40.5
7/12/2004	WT134	4	3pS	0.005	0.263	0.263	17.9
7/12/2004	WT134	4	3aS	0.005	0.263	0.258	17.9
7/12/2004	WT134	4	3bS	0.005	0.263	0.309	21.0
7/12/2004	WT134	4	3cS	0.005	0.263	0.395	26.8
7/12/2004	WT134	4	3dS	0.005	0.263	0.567	38.5
7/12/2004	WT134	4	3pU	0.019	0.309	0.309	18.8
7/12/2004	WT134	4	3aU	0.019	0.309	0.286	18.8
7/12/2004	WT134	4	3bU	0.019	0.309	0.357	21.3
7/12/2004	WT134	4	3cU	0.019	0.309	0.454	27.6
7/12/2004	WT134	4	3dS	0.019	0.309	0.662	40.2

Appendix A (continued

Table 23 – Results for Z_0, U^* profile, and U^* erosion and U 10

Date	Site	Nominal Wind Erodibility Group	Run	zo (cm)	U*profile (m/sec)	U*erosion (m/sec)	U10 (mph)
7/23/2004	WT135	6	1pS	0.011	0.268	0.268	17.1
7/23/2004	WT135	6	1aS	0.011	0.268	0.268	17.1
7/23/2004	WT135	6	1bS	0.011	0.268	0.392	25.0
7/23/2004	WT135	6	1cS	0.011	0.268	0.549	35.0
7/23/2004	WT135	6	1dS	0.011	0.268	0.706	45.0
7/23/2004	WT135	6	1pU	0.003	0.196	0.196	13.8
7/23/2004	WT135	6	1aU	0.003	0.196	0.212	15.0
7/23/2004	WT135	6	1bU	0.003	0.196	0.353	25.0
7/23/2004	WT135	6	1cU	0.003	0.196	0.495	35.0
7/23/2004	WT135	6	1dU	0.003	0.196	0.536	37.9
7/23/2004	WT135	6	2pS	0.024	0.261	0.261	15.6
7/23/2004	WT135	6	2aS	0.024	0.261	0.268	16.0
7/23/2004	WT135	6	2bS	0.024	0.261	0.419	25.0
7/23/2004	WT135	6	2cS	0.024	0.261	0.587	35.0
7/23/2004	WT135	6	2dS	0.024	0.261	0.713	42.5
7/23/2004	WT135	6	2pU	0.013	0.259	0.259	16.2
7/23/2004	WT135	6	2aU	0.013	0.259	0.245	16.2
7/23/2004	WT135	6	2bU	0.013	0.259	0.398	25.0
7/23/2004	WT135	6	2cU	0.013	0.259	0.558	35.0
7/23/2004	WT135	6	2dU	0.013	0.259	0.690	43.3
7/23/2004	WT135	6	3pS	0.004	0.205	0.205	14.4
7/23/2004	WT135	6	3aS	0.004	0.205	0.214	15.0
7/23/2004	WT135	6	3bS	0.004	0.205	0.356	25.0
7/23/2004	WT135	6	3cS	0.004	0.205	0.463	32.5
7/23/2004	WT135	6	3dS	0.004	0.205	0.501	35.1
7/23/2004	WT135	6	3pU	0.000	0.118	0.118	11.8
7/23/2004	WT135	6	3aU	0.000	0.118	0.151	15.0
7/23/2004	WT135	6	3bU	0.000	0.118	0.252	25.0
7/23/2004	WT135	6	3cU	0.000	0.118	0.301	29.9
7/23/2004	WT135	6	3dU	0.000	0.118	0.309	30.7

Appendix A (continued)

Table 23 – Results for Z_0, U^* profile, and U^* erosion and U 10

Date	Site	Nominal Wind Erodibility Group	Run	zo (cm)	U*profile (m/sec)	U*erosion (m/sec)	U10 (mph)
7/29/2004	WT136	0	1pS	0.008	0.221	0.221	14.5
7/29/2004	WT136	0	1aS	0.008	0.221	0.228	15.0
7/29/2004	WT136	0	1bS	0.008	0.221	0.379	25.0
7/29/2004	WT136	0	1cS	0.008	0.221	0.531	35.0
7/29/2004	WT136	0	1dS	0.008	0.221	0.601	39.6
7/29/2004	WT136	0	1pU	0.000	0.131	0.131	13.4
7/29/2004	WT136	0	1aU	0.000	0.131	0.147	15.0
7/29/2004	WT136	0	1bU	0.000	0.131	0.246	25.0
7/29/2004	WT136	0	1cU	0.000	0.131	0.309	31.4
7/29/2004	WT136	0	1dU	0.000	0.131	0.343	34.9
7/29/2004	WT136	0	2pS	0.002	0.199	0.199	14.8
7/29/2004	WT136	0	2aS	0.002	0.199	0.202	15.0
7/29/2004	WT136	0	2bS	0.002	0.199	0.337	25.0
7/29/2004	WT136	0	2cS	0.002	0.199	0.472	35.0
7/29/2004	WT136	0	2dS	0.002	0.199	0.542	40.2
7/29/2004	WT136	0	2pU	0.000	0.180	0.181	14.9
7/29/2004	WT136	0	2aU	0.000	0.180	0.181	15.0
7/29/2004	WT136	0	2bU	0.000	0.180	0.301	25.0
7/29/2004	WT136	0	2cU	0.000	0.180	0.405	33.6
7/29/2004	WT136	0	2dU	0.000	0.180	0.435	36.1
7/29/2004	WT136	0	3pS	0.009	0.307	0.307	19.9
7/29/2004	WT136	0	3aS	0.009	0.307	0.309	20.0
7/29/2004	WT136	0	3bS	0.009	0.307	0.386	25.0
7/29/2004	WT136	0	3cS	0.009	0.307	0.540	35.0
7/29/2004	WT136	0	3dS	0.009	0.307	0.680	44.1
7/29/2004	WT136	0	3pU	0.012	0.263	0.263	16.6
7/29/2004	WT136	0	3aU	0.012	0.263	0.268	17.0
7/29/2004	WT136	0	3bU	0.012	0.263	0.394	25.0
7/29/2004	WT136	0	3cU	0.012	0.263	0.552	35.0
7/29/2004	WT136	0	3dU	0.012	0.263	0.664	42.1

Appendix A (continued)

Table 23 – Results for Z_0, U^* profile, and U^* erosion and U 10

Date	Site	Nominal Wind Erodibility Group	Run	zo (cm)	U*profile (m/sec)	U*erosion (m/sec)	U10 (mph)
8/10/2004	WT137	4	1pS	0.028	0.292	0.292	17.1
8/10/2004	WT137	4	1aS	0.028	0.292	0.307	18.0
8/10/2004	WT137	4	1bS	0.028	0.292	0.426	25.0
8/10/2004	WT137	4	1cS	0.028	0.292	0.597	35.0
8/10/2004	WT137	4	1dS	0.028	0.292	0.767	45.0
8/10/2004	WT137	4	1pU	0.001	0.201	0.201	15.1
8/10/2004	WT137	4	1aU	0.001	0.201	0.213	16.0
8/10/2004	WT137	4	1bU	0.001	0.201	0.333	25.0
8/10/2004	WT137	4	1cU	0.001	0.201	0.466	35.0
8/10/2004	WT137	4	1dU	0.001	0.201	0.577	43.3
8/10/2004	WT137	4	2pS	0.000	0.132	0.132	14.4
8/10/2004	WT137	4	2aS	0.000	0.132	0.137	15.0
8/10/2004	WT137	4	2bS	0.000	0.132	0.229	25.0
8/10/2004	WT137	4	2cS	0.000	0.132	0.320	35.0
8/10/2004	WT137	4	2dS	0.000	0.132	0.361	39.4
8/10/2004	WT137	4	2pU	0.000	0.169	0.169	15.9
8/10/2004	WT137	4	2aU	0.000	0.169	0.170	16.0
8/10/2004	WT137	4	2bU	0.000	0.169	0.266	25.0
8/10/2004	WT137	4	2cU	0.000	0.169	0.372	35.0
8/10/2004	WT137	4	2dU	0.000	0.169	0.419	39.4
8/10/2004	WT137	4	3pS	0.001	0.197	0.197	15.9
8/10/2004	WT137	4	3aS	0.001	0.197	0.204	16.5
8/10/2004	WT137	4	3bS	0.001	0.197	0.310	25.0
8/10/2004	WT137	4	3cS	0.001	0.197	0.433	35.0
8/10/2004	WT137	4	3dS	0.001	0.197	0.541	43.7
8/10/2004	WT137	4	3pU	0.000	0.095	0.095	12.7
8/10/2004	WT137	4	3aU	0.000	0.095	0.112	15.0
8/10/2004	WT137	4	3bU	0.000	0.095	0.187	25.0
8/10/2004	WT137	4	3cU	0.000	0.095	0.239	32.0
8/10/2004	WT137	4	3dU	0.000	0.095	0.255	34.2

Appendix A (continued

Table 23 – Results for Z_0, U^* profile, and U^* erosion and U 10

Date	Site	Nominal Wind Erodibility Group	Run	zo (cm)	U*profile (m/sec)	U*erosion (m/sec)	U10 (mph)
8/11/2004	WT138	3	1pS	0.000	0.099	0.099	13.0
8/11/2004	WT138	3	1aS	0.000	0.099	0.102	13.5
8/11/2004	WT138	3	1bS	0.000	0.099	0.190	25.0
8/11/2004	WT138	3	1cS	0.000	0.099	0.262	34.5
8/11/2004	WT138	3	1dS	0.000	0.099	0.274	36.2
8/11/2004	WT138	3	1pU	0.000	0.209	0.209	17.1
8/11/2004	WT138	3	1aU	0.000	0.209	0.213	17.4
8/11/2004	WT138	3	1bU	0.000	0.209	0.306	25.0
8/11/2004	WT138	3	1cU	0.000	0.209	0.428	35.0
8/11/2004	WT138	3	1dU	0.000	0.209	0.521	42.6
8/11/2004	WT138	3	2pS	0.001	0.233	0.233	17.6
8/11/2004	WT138	3	2aS	0.001	0.233	0.251	19.0
8/11/2004	WT138	3	2bS	0.001	0.233	0.330	25.0
8/11/2004	WT138	3	2cS	0.001	0.233	0.462	35.0
8/11/2004	WT138	3	2dS	0.001	0.233	0.594	45.0
8/11/2004	WT138	3	2pU	0.002	0.231	0.231	16.9
8/11/2004	WT138	3	2aU	0.002	0.231	0.232	17.0
8/11/2004	WT138	3	2bU	0.002	0.231	0.341	25.0
8/11/2004	WT138	3	2cU	0.002	0.231	0.477	35.0
8/11/2004	WT138	3	2dU	0.002	0.231	0.614	45.0
8/11/2004	WT138	3	3pS	0.002	0.214	0.214	15.5
8/11/2004	WT138	3	3aS	0.002	0.214	0.236	17.1
8/11/2004	WT138	3	3bS	0.002	0.214	0.346	25.0
8/11/2004	WT138	3	3cS	0.002	0.214	0.484	35.0
8/11/2004	WT138	3	3dS	0.002	0.214	0.622	45.0
8/11/2004	WT138	3	3pU	0.007	0.151	0.151	13.9
8/11/2004	WT138	3	3aU	0.007	0.151	0.163	15.0
8/11/2004	WT138	3	3bU	0.007	0.151	0.272	25.0
8/11/2004	WT138	3	3cU	0.007	0.151	0.380	35.0
8/11/2004	WT138	3	3dU	0.007	0.151	0.449	41.4

Appendix A (continued)

Table 23 – Results for Z_0, U^* profile, and U^* erosion and U 10

Date	Site	Nominal Wind Erodibility Group	Run	zo (cm)	U*profile (m/sec)	U*erosion (m/sec)	U10 (mph)
8/12/2004	WT139	4	1pS	0.010	0.242	0.242	15.6
8/12/2004	WT139	4	1aS	0.010	0.242	0.284	18.3
8/12/2004	WT139	4	1bS	0.010	0.242	0.388	25.0
8/12/2004	WT139	4	1cS	0.010	0.242	0.544	35.0
8/12/2004	WT139	4	1dS	0.010	0.242	0.699	45.0
8/12/2004	WT139	4	1pU	0.000	0.114	0.114	12.3
8/12/2004	WT139	4	1aU	0.000	0.114	0.121	13.0
8/12/2004	WT139	4	1bU	0.000	0.114	0.232	25.0
8/12/2004	WT139	4	1cU	0.000	0.114	0.325	35.0
8/12/2004	WT139	4	1dU	0.000	0.114	0.345	37.2
8/12/2004	WT139	4	2pS	0.002	0.201	0.201	14.9
8/12/2004	WT139	4	2aS	0.002	0.201	0.215	16.0
8/12/2004	WT139	4	2bS	0.002	0.201	0.336	25.0
8/12/2004	WT139	4	2cS	0.002	0.201	0.441	32.8
8/12/2004	WT139	4	2dS	0.002	0.201	0.566	42.1
8/12/2004	WT139	4	2pU	0.008	0.232	0.232	15.2
8/12/2004	WT139	4	2aU	0.008	0.232	0.237	15.5
8/12/2004	WT139	4	2bU	0.008	0.232	0.383	25.0
8/12/2004	WT139	4	2cU	0.008	0.232	0.536	35.0
8/12/2004	WT139	4	2dU	0.008	0.232	0.689	45.0
8/12/2004	WT139	4	3pS	0.000	0.143	0.143	13.4
8/12/2004	WT139	4	3aS	0.000	0.143	0.160	15.0
8/12/2004	WT139	4	3bS	0.000	0.143	0.267	25.0
8/12/2004	WT139	4	3cS	0.000	0.143	0.373	35.0
8/12/2004	WT139	4	3dS	0.000	0.143	0.420	39.4
8/12/2004	WT139	4	3pU	0.002	0.235	0.235	17.0
8/12/2004	WT139	4	3aU	0.002	0.235	0.242	17.5
8/12/2004	WT139	4	3bU	0.002	0.235	0.346	25.0
8/12/2004	WT139	4	3cU	0.002	0.235	0.484	35.0
8/12/2004	WT139	4	3dU	0.002	0.235	0.622	45.0

Appendix A (continued)

Table 23 – Results for Z_0, U^* profile, and U^* erosion and U 10

Date	Site	Nominal Wind Erodibility Group	Run	zo (cm)	U*profile (m/sec)	U*erosion (m/sec)	U10 (mph)
8/13/2004	WT140	4	1pS	0.000	0.154	0.154	14.9
8/13/2004	WT140	4	1aS	0.000	0.154	0.155	15.0
8/13/2004	WT140	4	1bS	0.000	0.154	0.258	25.0
8/13/2004	WT140	4	1cS	0.000	0.154	0.330	32.0
8/13/2004	WT140	4	1dS	0.000	0.154	0.349	33.9
8/13/2004	WT140	4	1pU	0.000	0.161	0.161	13.5
8/13/2004	WT140	4	1aU	0.000	0.161	0.179	15.0
8/13/2004	WT140	4	1bU	0.000	0.161	0.298	25.0
8/13/2004	WT140	4	1cU	0.000	0.161	0.352	29.5
8/13/2004	WT140	4	1dU	0.000	0.161	0.369	31.0
8/13/2004	WT140	4	2pS	0.015	0.260	0.260	16.1
8/13/2004	WT140	4	2aS	0.015	0.260	0.258	16.1
8/13/2004	WT140	4	2bS	0.015	0.260	0.403	25.0
8/13/2004	WT140	4	2cS	0.015	0.260	0.564	35.0
8/13/2004	WT140	4	2dS	0.015	0.260	0.669	41.5
8/13/2004	WT140	4	2pU	0.000	0.103	0.103	12.3
8/13/2004	WT140	4	2aU	0.000	0.103	0.103	12.3
8/13/2004	WT140	4	2bU	0.000	0.103	0.169	20.0
8/13/2004	WT140	4	2cU	0.000	0.103	0.232	27.6
8/13/2004	WT140	4	2dU	0.000	0.103	0.259	30.7
8/13/2004	WT140	4	3pS	0.007	0.196	0.196	13.0
8/13/2004	WT140	4	3aS	0.007	0.196	0.035	15.0
8/13/2004	WT140	4	3bS	0.007	0.196	0.096	25.0
8/13/2004	WT140	4	3cS	0.007	0.196	0.506	33.7
8/13/2004	WT140	4	3dS	0.007	0.196	0.554	36.9
8/13/2004	WT140	4	3pU	0.005	0.166	0.166	11.4
8/13/2004	WT140	4	3aU	0.005	0.166	0.190	13.0
8/13/2004	WT140	4	3bU	0.005	0.166	0.365	25.0
8/13/2004	WT140	4	3cU	0.005	0.166	0.494	33.9
8/13/2004	WT140	4	3dU	0.005	0.166	0.523	35.8

Appendix A (continued)

Table 23 – Results for Z_0, U^* profile, and U^* erosion and U 10

Date	Site	Nominal Wind Erodibility Group	Run	zo (cm)	U*profile (m/sec)	U*erosion (m/sec)	U10 (mph)
8/18/2004	WT141	3	1pS	0.012	0.243	0.243	15.4
8/18/2004	WT141	3	1aS	0.012	0.243	0.253	16.0
8/18/2004	WT141	3	1bS	0.012	0.243	0.395	25.0
8/18/2004	WT141	3	1cS	0.012	0.243	0.553	35.0
8/18/2004	WT141	3	1dS	0.012	0.243	0.681	43.1
8/18/2004	WT141	3	1pU	1.010	0.256	0.256	16.5
8/18/2004	WT141	3	1aU	1.010	0.256	0.264	17.0
8/18/2004	WT141	3	1bU	1.010	0.256	0.388	25.0
8/18/2004	WT141	3	1cU	1.010	0.256	0.544	35.0
8/18/2004	WT141	3	1dU	1.010	0.256	0.699	45.0
8/18/2004	WT141	3	2pS	0.000	0.115	0.115	14.2
8/18/2004	WT141	3	2aS	0.000	0.115	0.112	14.2
8/18/2004	WT141	3	2bS	0.000	0.115	0.203	25.0
8/18/2004	WT141	3	2cS	0.000	0.115	0.244	30.1
8/18/2004	WT141	3	2dS	0.000	0.115	0.261	32.2
8/18/2004	WT141	3	2pU	0.000	0.125	0.125	14.0
8/18/2004	WT141	3	2aU	0.000	0.125	0.133	15.0
8/18/2004	WT141	3	2bU	0.000	0.125	0.222	25.0
8/18/2004	WT141	3	2cU	0.000	0.125	0.274	30.8
8/18/2004	WT141	3	2dU	0.000	0.125	0.291	32.8
8/18/2004	WT141	3	3pS	0.001	0.175	0.175	13.9
8/18/2004	WT141	3	3aS	0.001	0.175	0.044	15.0
8/18/2004	WT141	3	3bS	0.001	0.175	0.121	25.0
8/18/2004	WT141	3	3cS	0.001	0.175	0.404	32.1
8/18/2004	WT141	3	3dS	0.001	0.175	0.438	34.8
8/18/2004	WT141	3	3pU	0.006	0.230	0.230	15.4
8/18/2004	WT141	3	3aU	0.006	0.230	0.280	16.0
8/18/2004	WT141	3	3bU	0.006	0.230	0.372	25.0
8/18/2004	WT141	3	3cU	0.006	0.230	0.521	35.0
8/18/2004	WT141	3	3dU	0.006	0.230	0.646	43.4

Appendix A (continued)

Table 23 – Results for Z_0, U^* profile, and U^* erosion and U 10

Date	Site	Nominal Wind Erodibility Group	Run	zo (cm)	U*profile (m/sec)	U*erosion (m/sec)	U10 (mph)
7/16/2004	WT142	4	1pS	0.045	0.278	0.278	15.6
7/16/2004	WT142	4	1aS	0.045	0.278	0.286	16.0
7/16/2004	WT142	4	1bS	0.045	0.278	0.446	25.0
7/16/2004	WT142	4	1cS	0.045	0.278	0.625	35.0
7/16/2004	WT142	4	1dS	0.045	0.278	0.726	40.7
7/16/2004	WT142	4	1pU	0.023	0.255	0.255	15.2
7/16/2004	WT142	4	1aU	0.023	0.255	0.268	16.0
7/16/2004	WT142	4	1bU	0.023	0.255	0.419	25.0
7/16/2004	WT142	4	1cU	0.023	0.255	0.587	35.0
7/16/2004	WT142	4	1dU	0.023	0.255	0.607	36.2
7/16/2004	WT142	4	2pS	0.012	0.234	0.234	14.9
7/16/2004	WT142	4	2aS	0.012	0.234	0.237	15.0
7/16/2004	WT142	4	2bS	0.012	0.234	0.394	25.0
7/16/2004	WT142	4	2cS	0.012	0.234	0.552	35.0
7/16/2004	WT142	4	2dS	0.012	0.234	0.607	38.5
7/16/2004	WT142	4	2pU	0.003	0.226	0.226	15.9
7/16/2004	WT142	4	2aU	0.003	0.226	0.255	18.0
7/16/2004	WT142	4	2bU	0.003	0.226	0.354	28.0
7/16/2004	WT142	4	2cU	0.003	0.226	0.505	35.7
7/16/2004	WT142	4	2dU	0.003	0.226	0.551	38.9
7/16/2004	WT142	4	3pS	0.000	0.124	0.124	11.1
7/16/2004	WT142	4	3aS	0.000	0.124	0.167	15.0
7/16/2004	WT142	4	3bS	0.000	0.124	0.278	25.0
7/16/2004	WT142	4	3cS	0.000	0.124	0.342	30.7
7/16/2004	WT142	4	3dS	0.000	0.124	0.353	31.7
7/16/2004	WT142	4	3pU	0.002	0.186	0.186	13.9
7/16/2004	WT142	4	3aU	0.002	0.186	0.200	15.0
7/16/2004	WT142	4	3bU	0.002	0.186	0.334	25.0
7/16/2004	WT142	4	3cU	0.002	0.186	0.468	35.0
7/16/2004	WT142	4	3dU	0.002	0.186	0.482	36.1

Appendix A (continued)

Table 23 – Results for Z_0, U^* profile, and U^* erosion and U 10

Date	Site	Nominal Wind Erodibility Group	Run	zo (cm)	U*profile (m/sec)	U*erosion (m/sec)	U10 (mph)
8/16/2004	WT143	4	1pS	0.004	0.215	0.215	14.8
8/16/2004	WT143	4	1aS	0.004	0.215	0.217	15.0
8/16/2004	WT143	4	1bS	0.004	0.215	0.362	25.0
8/16/2004	WT143	4	1cS	0.004	0.215	0.463	32.0
8/16/2004	WT143	4	1dS	0.004	0.215	0.499	34.5
8/16/2004	WT143	4	1pU	0.009	0.217	0.217	14.1
8/16/2004	WT143	4	1aU	0.009	0.217	0.230	15.0
8/16/2004	WT143	4	1bU	0.009	0.217	0.385	25.0
8/16/2004	WT143	4	1cU	0.009	0.217	0.539	35.0
8/16/2004	WT143	4	1dU	0.009	0.217	0.596	38.7
8/16/2004	WT143	4	2pS	0.020	0.255	0.255	15.4
8/16/2004	WT143	4	2aS	0.020	0.255	0.256	15.5
8/16/2004	WT143	4	2bS	0.020	0.255	0.413	25.0
8/16/2004	WT143	4	2cS	0.020	0.255	0.578	35.0
8/16/2004	WT143	4	2dS	0.020	0.255	0.646	39.1
8/16/2004	WT143	4	2pU	0.002	0.179	0.179	13.1
8/16/2004	WT143	4	2aU	0.002	0.179	0.205	15.0
8/16/2004	WT143	4	2bU	0.002	0.179	0.341	25.0
8/16/2004	WT143	4	2cU	0.002	0.179	0.426	31.2
8/16/2004	WT143	4	2dU	0.002	0.179	0.497	36.4
8/16/2004	WT143	4	3pS	0.002	0.182	0.182	13.3
8/16/2004	WT143	4	3aS	0.002	0.182	0.205	15.0
8/16/2004	WT143	4	3bS	0.002	0.182	0.342	25.0
8/16/2004	WT143	4	3cS	0.002	0.182	0.453	33.1
8/16/2004	WT143	4	3dS	0.002	0.182	0.520	38.0
8/16/2004	WT143	4	3pU	0.034	0.264	0.264	15.2
8/16/2004	WT143	4	3aU	0.034	0.264	0.296	17.0
8/16/2004	WT143	4	3bU	0.034	0.264	0.435	25.0
8/16/2004	WT143	4	3cU	0.034	0.264	0.608	35.0
8/16/2004	WT143	4	3dU	0.034	0.264	0.782	45.0

Appendix A (continued)

Table 23 – Results for Z_0, U^* profile, and U^* erosion and U 10

Date	Site	Nominal Wind Erodibility Group	Run	zo (cm)	U*profile (m/sec)	U*erosion (m/sec)	U10 (mph)
8/9/2004	WT144	4	1pS	0.000	0.096	0.096	11.6
8/9/2004	WT144	4	1aS	0.000	0.096	0.062	15.0
8/9/2004	WT144	4	1bS	0.000	0.096	0.171	25.0
8/9/2004	WT144	4	1cS	0.000	0.096	0.223	27.0
8/9/2004	WT144	4	1dS	0.000	0.096	0.234	28.4
8/9/2004	WT144	4	1pU	0.003	0.202	0.202	14.3
8/9/2004	WT144	4	1aU	0.003	0.202	0.212	15.0
8/9/2004	WT144	4	1bU	0.003	0.202	0.353	25.0
8/9/2004	WT144	4	1cU	0.003	0.202	0.494	35.0
8/9/2004	WT144	4	1dU	0.003	0.202	0.638	37.9
8/9/2004	WT144	4	2pS	0.000	0.117	0.117	13.2
8/9/2004	WT144	4	2aS	0.000	0.117	0.133	15.0
8/9/2004	WT144	4	2bS	0.000	0.117	0.221	25.0
8/9/2004	WT144	4	2cS	0.000	0.117	0.235	28.6
8/9/2004	WT144	4	2dS	0.000	0.117	0.259	29.3
8/9/2004	WT144	4	2pU	0.005	0.176	0.176	12.0
8/9/2004	WT144	4	2aU	0.005	0.176	0.219	15.0
8/9/2004	WT144	4	2bU	0.005	0.176	0.364	25.0
8/9/2004	WT144	4	2cU	0.005	0.176	0.510	35.0
8/9/2004	WT144	4	2dU	0.005	0.176	0.554	38.0
8/9/2004	WT144	4	3pS	0.000	0.131	0.131	13.9
8/9/2004	WT144	4	3aS	0.000	0.131	0.142	15.0
8/9/2004	WT144	4	3bS	0.000	0.131	0.237	25.0
8/9/2004	WT144	4	3cS	0.000	0.131	0.309	32.6
8/9/2004	WT144	4	3dS	0.000	0.131	0.335	35.4
8/9/2004	WT144	4	3pU	0.002	0.229	0.229	16.8
8/9/2004	WT144	4	3aU	0.002	0.229	0.209	16.8
8/9/2004	WT144	4	3bU	0.002	0.229	0.340	25.0
8/9/2004	WT144	4	3cU	0.002	0.229	0.475	35.0
8/9/2004	WT144	4	3dU	0.002	0.229	0.557	41.0

Appendix A (continued)

Table 23 – Results for Z_0, U^* profile, and U^* erosion and U 10

Date	Site	Nominal Wind Erodibility Group	Run	zo (cm)	U*profile (m/sec)	U*erosion (m/sec)	U10 (mph)
8/17/2004	WT146	6	1pS	0.042	0.296	0.296	16.6
8/17/2004	WT146	6	1aS	0.042	0.296	0.305	17.2
8/17/2004	WT146	6	1bS	0.042	0.296	0.443	25.0
8/17/2004	WT146	6	1cS	0.042	0.296	0.620	35.0
8/17/2004	WT146	6	1dS	0.042	0.296	0.755	42.6
8/17/2004	WT146	6	1pU	0.000	0.140	0.140	13.7
8/17/2004	WT146	6	1aU	0.000	0.140	0.139	13.7
8/17/2004	WT146	6	1bU	0.000	0.140	0.257	25.0
8/17/2004	WT146	6	1cU	0.000	0.140	0.294	28.6
8/17/2004	WT146	6	1dU	0.000	0.140	0.315	30.7
8/17/2004	WT146	6	2pS	0.001	0.170	0.170	13.6
8/17/2004	WT146	6	2aS	0.001	0.170	0.164	13.6
8/17/2004	WT146	6	2bS	0.001	0.170	0.311	25.0
8/17/2004	WT146	6	2cS	0.001	0.170	0.388	31.3
8/17/2004	WT146	6	2dS	0.001	0.170	0.403	32.4
8/17/2004	WT146	6	2pU	0.020	0.277	0.277	16.8
8/17/2004	WT146	6	2aU	0.020	0.277	0.318	19.2
8/17/2004	WT146	6	2bU	0.020	0.277	0.414	25.0
8/17/2004	WT146	6	2cU	0.020	0.277	0.579	35.0
8/17/2004	WT146	6	2dU	0.020	0.277	0.745	45.0
8/17/2004	WT146	6	3pS	0.026	0.272	0.272	16.2
8/17/2004	WT146	6	3aS	0.026	0.272	0.285	17.0
8/17/2004	WT146	6	3bS	0.026	0.272	0.419	25.0
8/17/2004	WT146	6	3cS	0.026	0.272	0.587	35.0
8/17/2004	WT146	6	3dS	0.026	0.272	0.698	41.6
8/17/2004	WT146	6	3pU	0.000	0.159	0.159	13.5
8/17/2004	WT146	6	3aU	0.000	0.159	0.166	14.0
8/17/2004	WT146	6	3bU	0.000	0.159	0.296	25.0
8/17/2004	WT146	6	3cU	0.000	0.159	0.414	35.0
8/17/2004	WT146	6	3dU	0.000	0.159	0.422	35.7

Appendix A (continued)

Table 23 – Results for Z_0, U^* profile, and U^* erosion and U 10

Date	Site	Nominal Wind Erodibility Group	Run	zo (cm)	U*profile (m/sec)	U*erosion (m/sec)	U10 (mph)
8/24/2004	WT147	4	1pS	0.000	0.161	0.161	14.1
8/24/2004	WT147	4	1aS	0.000	0.161	0.171	15.0
8/24/2004	WT147	4	1bS	0.000	0.161	0.286	25.0
8/24/2004	WT147	4	1cS	0.000	0.161	0.367	32.1
8/24/2004	WT147	4	1dS	0.000	0.161	0.400	35.0
8/24/2004	WT147	4	1pU	0.000	0.156	0.156	13.7
8/24/2004	WT147	4	1aU	0.000	0.156	0.171	15.0
8/24/2004	WT147	4	1bU	0.000	0.156	0.285	25.0
8/24/2004	WT147	4	1cU	0.000	0.156	0.374	32.8
8/24/2004	WT147	4	1dU	0.000	0.156	0.404	35.5
8/24/2004	WT147	4	2pS	0.005	0.212	0.212	14.5
8/24/2004	WT147	4	2aS	0.005	0.212	0.218	15.0
8/24/2004	WT147	4	2bS	0.005	0.212	0.364	25.0
8/24/2004	WT147	4	2cS	0.005	0.212	0.505	34.7
8/24/2004	WT147	4	2dS	0.005	0.212	0.536	36.8
8/24/2004	WT147	4	2pU	0.000	0.163	0.163	13.3
8/24/2004	WT147	4	2aU	0.000	0.163	0.184	15.0
8/24/2004	WT147	4	2bU	0.000	0.163	0.306	25.0
8/24/2004	WT147	4	2cU	0.000	0.163	0.371	30.3
8/24/2004	WT147	4	2dU	0.000	0.163	0.390	31.9
8/24/2004	WT147	4	3pS	0.010	0.251	0.251	16.2
8/24/2004	WT147	4	3aS	0.010	0.251	0.264	17.0
8/24/2004	WT147	4	3bS	0.010	0.251	0.388	25.0
8/24/2004	WT147	4	3cS	0.010	0.251	0.544	35.0
8/24/2004	WT147	4	3dS	0.010	0.251	0.637	41.0
8/24/2004	WT147	4	3pU	0.000	0.163	0.080	13.5
8/24/2004	WT147	4	3aU	0.000	0.163	0.181	15.0
8/24/2004	WT147	4	3bU	0.000	0.163	0.302	25.0
8/24/2004	WT147	4	3cU	0.000	0.163	0.348	28.8
8/24/2004	WT147	4	3dU	0.000	0.163	0.393	32.5

Appendix A (continued)

Table 23 – Results for Z_0, U^* profile, and U^* erosion and U 10

Date	Site	Nominal Wind Erodibility Group	Run	zo (cm)	U*profile (m/sec)	U*erosion (m/sec)	U10 (mph)
8/25/2004	WT148	2	1pS	0.004	0.225	0.225	15.6
8/25/2004	WT148	2	1aS	0.004	0.225	0.231	16.0
8/25/2004	WT148	2	1bS	0.004	0.225	0.360	25.0
8/25/2004	WT148	2	1cS	0.004	0.225	0.504	35.0
8/25/2004	WT148	2	1dS	0.004	0.225	0.555	38.5
8/25/2004	WT148	2	1pU	0.027	0.280	0.280	16.5
8/25/2004	WT148	2	1aU	0.027	0.280	0.272	16.0
8/25/2004	WT148	2	1bU	0.027	0.280	0.425	25.0
8/25/2004	WT148	2	1cU	0.027	0.280	0.594	35.0
8/25/2004	WT148	2	1dU	0.027	0.280	0.764	45.0
8/25/2004	WT148	2	2pS	0.006	0.254	0.254	17.0
8/25/2004	WT148	2	2aS	0.006	0.254	0.247	17.0
8/25/2004	WT148	2	2bS	0.006	0.254	0.374	25.0
8/25/2004	WT148	2	2cS	0.006	0.254	0.524	35.0
8/25/2004	WT148	2	2dS	0.006	0.254	0.575	38.4
8/25/2004	WT148	2	2pU	0.000	0.081	0.081	11.7
8/25/2004	WT148	2	2aU	0.000	0.081	0.104	15.0
8/25/2004	WT148	2	2bU	0.000	0.081	0.173	25.0
8/25/2004	WT148	2	2cU	0.000	0.081	0.195	28.2
8/25/2004	WT148	2	2dU	0.000	0.081	0.203	29.3
8/25/2004	WT148	2	3pS	0.001	0.168	0.168	13.1
8/25/2004	WT148	2	3aS	0.001	0.168	0.192	15.0
8/25/2004	WT148	2	3bS	0.001	0.168	0.320	25.0
8/25/2004	WT148	2	3cS	0.001	0.168	0.403	31.5
8/25/2004	WT148	2	3dS	0.001	0.168	0.433	33.8
8/25/2004	WT148	2	3pU	0.001	0.192	0.192	15.0
8/25/2004	WT148	2	3aU	0.001	0.192	0.192	15.0
8/25/2004	WT148	2	3bU	0.001	0.192	0.321	25.0
8/25/2004	WT148	2	3cU	0.001	0.192	0.430	33.6
8/25/2004	WT148	2	3dU	0.001	0.192	0.485	37.9

Appendix B – Individual site PM-10 concentration, flux and spike results

Table 24 – Results for spike-corrected TSI erosion and ambient concentration, flow, PM-10 cumulative flux, individual PM-10 erosion and ambient net spike mass, and PM-10 net spike mass

Note: If the field labeled "Avg Tsi Ambient Conc. (mg/m3)" is higher than the field "spike-corrected TSI AVG erosion conc (mg/m^3)", then the calculated value in the field "concentration difference (mg/m3)" would be a negative concentration. Since this is not possible, a value of 0.000 is substituted when the difference (spike-corrected average) – (average Tsi ambient) is less than zero.

Date	Site	Nominal Wind Erodibility Group	Run	spike-corrected TSI Avg erosion conc (mg/m^3)	Avg Tsi Ambient Conc (mg/m3)	concentration difference (mg/m3)	Q (ACFM)	Cumulative PM 10 Flux ton/(acre-hr) = flux in mg / (m2-min) x 1lb/454,000 mg x 1 ton/2000lb x (.305meter / ft)^2 x 43560 ft2/acre x 60 min/hr	Individual PM 10 erosion net spike mass (mg)	Individual PM 10 ambient net spike mass (mg)	Individual PM 10 net spike mass (mg)	PM 10 spike "pulse" (ton/acre)
7/14/2004	WT111	5	1pS	0.174	0.000	0.173	474.20	2.91E-03	0.0119	0.0000	0.0119	2.29E-07
7/14/2004	WT111	5	1aS	0.112	0.000	0.112	474.94	4.80E-03	0.0006	0.0013	0.0000	0.00E+00
7/14/2004	WT111	5	1bS	0.133	0.000	0.133	474.94	7.03E-03	0.0133	0.0043	0.0090	1.73E-07
7/14/2004	WT111	5	1cS	0.186	0.000	0.186	474.94	1.02E-02	0.0459	0.0032	0.0427	8.20E-07
7/14/2004	WT111	5	1dS	0.488	0.000	0.488	490.95	1.86E-02	0.0607	0.0008	0.0599	1.15E-06
7/14/2004	WT111	5	1pU	0.119	0.029	0.090	484.28	1.54E-03	0.0001	0.0000	0.0000	4.48E-10
7/14/2004	WT111	5	1aU	0.097	0.044	0.053	484.28	2.44E-03	0.0002	0.0001	0.0001	2.38E-09
7/14/2004	WT111	5	1bU	0.114	0.200	0.000	484.28	2.44E-03	0.0010	0.0005	0.0005	1.02E-08
7/14/2004	WT111	5	1cU	0.199	0.034	0.166	484.28	5.28E-03	0.1093	0.0029	0.1065	2.04E-06
7/14/2004	WT111	5	1dU	0.580	0.167	0.413	484.28	1.24E-02	0.2072	0.0012	0.2060	3.95E-06
7/14/2004	WT111	5	2pS	0.261	0.125	0.137	485.32	2.35E-03	0.0110	0.0049	0.0062	1.18E-07
7/14/2004	WT111	5	2aS	0.087	0.103	0.000	485.32	2.35E-03	0.0004	0.0001	0.0003	5.45E-09
7/14/2004	WT111	5	2bS	0.189	0.060	0.130	485.32	4.57E-03	0.0062	0.0045	0.0017	3.25E-08
7/14/2004	WT111	5	2cS	0.330	0.086	0.244	485.32	8.75E-03	0.0603	0.0019	0.0584	1.12E-06
7/14/2004	WT111	5	2dS	0.188	0.071	0.117	503.03	1.08E-02	0.0013	0.0004	0.0009	1.67E-08
7/14/2004	WT111	5	2pU	0.091	0.072	0.019	481.55	3.27E-04	0.0002	0.0001	0.0000	6.94E-10
7/14/2004	WT111	5	2aU	0.187	0.072	0.115	481.55	2.29E-03	0.0004	0.0001	0.0003	5.45E-09
7/14/2004	WT111	5	2bU	0.137	0.048	0.089	481.55	3.79E-03	0.0422	0.0020	0.0402	7.72E-07
7/14/2004	WT111	5	2cU	0.327	0.087	0.240	481.55	7.87E-03	0.1072	0.0018	0.1055	2.02E-06
7/14/2004	WT111	5	2dU	0.846	0.060	0.786	507.36	2.19E-02	0.5819	0.0036	0.5783	1.11E-05
7/14/2004	WT111	5	3pS	0.142	0.066	0.076	490.00	1.32E-03	0.0063	0.0011	0.0052	9.97E-08
7/14/2004	WT111	5	3aS	0.109	0.068	0.041	490.76	2.02E-03	0.0002	0.0001	0.0001	1.66E-09
7/14/2004	WT111	5	3bS	0.211	0.196	0.015	490.76	2.28E-03	0.0053	0.0065	0.0000	0.00E+00
7/14/2004	WT111	5	3cS	0.125	0.375	0.000	490.76	2.28E-03	0.0505	0.0024	0.0481	9.23E-07
7/14/2004	WT111	5	3dS	0.227	0.498	0.000	512.91	2.28E-03	0.1759	0.0108	0.1651	3.17E-06
7/14/2004	WT111	5	3pU	0.170	0.096	0.075	490.28	1.29E-03	0.0004	0.0002	0.0003	5.15E-09
7/14/2004	WT111	5	3aU	0.201	0.102	0.099	490.28	3.01E-03	0.0175	0.0071	0.0105	2.01E-07
7/14/2004	WT111	5	3bU	0.363	0.090	0.274	490.28	7.73E-03	0.0160	0.0011	0.0148	2.85E-07
7/14/2004	WT111	5	3cU	0.702	0.048	0.654	490.28	1.90E-02	0.1585	0.0029	0.1557	2.99E-06
7/14/2004	WT111	5	3dU	0.655	0.067	0.587	503.52	2.94E-02	0.2594	0.0040	0.2554	4.90E-06

Appendix B (continued)

Table 24 – Results for spike-corrected TSI erosion and ambient concentration, flow, PM-10 cumulative flux, individual PM-10 erosion and ambient net spike mass, and PM-10 net spike mass

Date	Site	Nominal Wind Erodibility Group	Run	spike-corrected TSI Avg erosion conc (mg/m^3)	Avg Tsi Ambient Conc (mg/m3)	concentration difference (mg/m3)	Q (ACFM)	Cumulative PM 10 Flux ton/(acre-hr) = flux in mg / (m2-min) x 1lb/454,000 mg x 1 ton/2000lb x (.305meter / ft)^2 x 43560 ft2/acre x 60 min/hr	Individual PM 10 erosion net spike mass (mg)	Individual PM 10 ambient net spike mass (mg)	Individual PM 10 net spike mass (mg)	PM 10 spike "pulse" (ton/acre)
7/21/2004	WT113	3	1pS	0.047	0.036	0.011	468.39	1.74E-04	0.0001	0.0001	0.0000	9.04E-11
7/21/2004	WT113	3	1aS	0.055	0.040	0.015	468.39	4.30E-04	0.0001	0.0002	0.0000	0.00E+00
7/21/2004	WT113	3	1bS	0.050	0.032	0.018	468.39	7.29E-04	0.0058	0.0012	0.0047	9.00E-08
7/21/2004	WT113	3	1cS	0.065	0.036	0.029	468.39	1.20E-03	0.0229	0.0018	0.0212	4.06E-07
7/21/2004	WT113	3	1dS	0.070	0.037	0.033	493.19	1.78E-03	0.0032	0.0009	0.0022	4.28E-08
7/21/2004	WT113	3	1pU	0.066	0.041	0.025	471.79	4.16E-04	0.0042	0.0015	0.0027	5.18E-08
7/21/2004	WT113	3	1aU	0.104	0.043	0.061	471.79	1.43E-03	0.0265	0.0029	0.0236	4.53E-07
7/21/2004	WT113	3	1bU	0.067	0.054	0.013	471.79	1.65E-03	0.0095	0.0038	0.0056	1.08E-07
7/21/2004	WT113	3	1cU	0.049	0.050	0.000	471.79	1.65E-03	0.0031	0.0015	0.0016	3.07E-08
7/21/2004	WT113	3	1dU	0.090	0.056	0.034	511.17	2.26E-03	0.0070	0.0011	0.0058	1.12E-07
7/21/2004	WT113	3	2pS	0.066	0.053	0.012	477.92	2.08E-04	0.0029	0.0015	0.0013	2.54E-08
7/21/2004	WT113	3	2aS	0.049	0.052	0.000	477.92	2.08E-04	0.0002	0.0002	0.0000	0.00E+00
7/21/2004	WT113	3	2bS	0.138	0.093	0.045	477.92	9.72E-04	0.0052	0.0019	0.0033	6.28E-08
7/21/2004	WT113	3	2cS	0.069	0.039	0.030	477.92	1.49E-03	0.0500	0.0014	0.0486	9.33E-07
7/21/2004	WT113	3	2dS	0.110	0.041	0.069	477.92	2.65E-03	0.0463	0.0032	0.0431	8.28E-07
7/21/2004	WT113	3	2pU	0.055	0.038	0.017	477.60	2.90E-04	0.0020	0.0008	0.0012	2.25E-08
7/21/2004	WT113	3	2aU	0.044	0.037	0.007	477.60	4.09E-04	0.0002	0.0003	0.0000	0.00E+00
7/21/2004	WT113	3	2bU	0.062	0.032	0.029	477.60	9.03E-04	0.0202	0.0024	0.0178	3.42E-07
7/21/2004	WT113	3	2cU	0.134	0.028	0.107	477.60	2.70E-03	0.0685	0.0034	0.0651	1.25E-06
7/21/2004	WT113	3	2dU	0.174	0.038	0.136	509.37	5.13E-03	0.0719	0.0059	0.0660	1.27E-06
7/21/2004	WT113	3	3pS	0.076	0.046	0.030	482.15	5.06E-04	0.0027	0.0008	0.0019	3.70E-08
7/21/2004	WT113	3	3aS	0.059	0.050	0.009	482.90	6.55E-04	0.0005	0.0001	0.0004	7.05E-09
7/21/2004	WT113	3	3bS	0.067	0.059	0.008	482.90	7.87E-04	0.0041	0.0005	0.0036	6.97E-08
7/21/2004	WT113	3	3cS	0.158	0.033	0.124	482.90	2.91E-03	0.0749	0.0108	0.0641	1.23E-06
7/21/2004	WT113	3	3dS	0.074	0.031	0.043	504.89	3.68E-03	0.0024	0.0011	0.0012	2.40E-08
7/21/2004	WT113	3	3pU	0.143	0.041	0.101	483.49	1.73E-03	0.0003	0.0001	0.0003	5.28E-09
7/21/2004	WT113	3	3aU	0.077	0.046	0.031	487.27	2.26E-03	0.0002	0.0003	0.0000	0.00E+00
7/21/2004	WT113	3	3bU	0.072	0.036	0.036	487.27	2.89E-03	0.0089	0.0021	0.0069	1.32E-07
7/21/2004	WT113	3	3cU	0.183	0.051	0.132	487.27	5.16E-03	0.0316	0.0009	0.0308	5.90E-07
7/21/2004	WT113	3	3dU	0.344	0.027	0.317	506.95	1.08E-02	0.0238	0.0011	0.0227	4.36E-07

Appendix B (continued)

Table 24 – Results for spike-corrected TSI erosion and ambient concentration, flow, PM-10 cumulative flux, individual PM-10 erosion and ambient net spike mass, and PM-10 net spike mass

Date	Site	Nominal Wind Erodibility Group	Run	spike-corrected TSI Avg erosion conc (mg/m^3)	Avg Tsi Ambient Conc (mg/m3)	concentration difference (mg/m3)	Q (ACFM)	Cumulative PM 10 Flux ton/(acre-hr) = flux in mg / (m2-min) x 1lb/454,000 mg x 1 ton/2000lb x (.305meter / ft)^2 x 43560 ft2/acre x 60 min/hr	Individual PM 10 erosion net spike mass (mg)	Individual PM 10 ambient net spike mass (mg)	Individual PM 10 net spike mass (mg)	PM 10 spike "pulse" (ton/acre)
7/22/2004	WT115	7	1pS	0.169	0.177	0.000	464.99	0.00E+00	0.0004	0.0003	0.0001	2.38E-09
7/22/2004	WT115	7	1aS	0.183	0.188	0.000	464.99	0.00E+00	0.0005	0.0005	0.0000	0.00E+00
7/22/2004	WT115	7	1bS	0.217	0.168	0.049	464.99	8.10E-04	0.0172	0.0038	0.0134	2.58E-07
7/22/2004	WT115	7	1cS	0.273	0.178	0.095	464.99	2.37E-03	0.1073	0.0078	0.0995	1.91E-06
7/22/2004	WT115	7	1dS	0.312	0.172	0.140	489.76	4.78E-03	0.0572	0.0172	0.0399	7.66E-07
7/22/2004	WT115	7	1pU	0.159	0.161	0.000	471.39	0.00E+00	0.0005	0.0003	0.0002	4.49E-09
7/22/2004	WT115	7	1aU	0.185	0.156	0.029	471.39	4.82E-04	0.0004	0.0003	0.0001	1.89E-09
7/22/2004	WT115	7	1bU	0.238	0.186	0.052	471.39	1.35E-03	0.0246	0.0069	0.0177	3.40E-07
7/22/2004	WT115	7	1cU	0.343	0.135	0.208	471.39	4.82E-03	0.2188	0.0081	0.2107	4.04E-06
7/22/2004	WT115	7	1dU	0.660	0.132	0.529	499.20	1.41E-02	0.4419	0.0122	0.4297	8.25E-06
7/22/2004	WT115	7	2pS	0.145	0.073	0.072	476.76	1.21E-03	0.0077	0.0012	0.0065	1.25E-07
7/22/2004	WT115	7	2aS	0.094	0.043	0.051	476.76	2.07E-03	0.0068	0.0011	0.0057	1.09E-07
7/22/2004	WT115	7	2bS	0.100	0.030	0.069	476.76	3.24E-03	0.0168	0.0011	0.0157	3.01E-07
7/22/2004	WT115	7	2cS	0.138	0.038	0.100	476.76	4.93E-03	0.0391	0.0009	0.0382	7.33E-07
7/22/2004	WT115	7	2dS	0.195	0.033	0.162	493.50	7.74E-03	0.0605	0.0023	0.0582	1.12E-06
7/22/2004	WT115	7	2pU	0.093	0.033	0.061	478.88	1.03E-03	0.0002	0.0001	0.0001	2.03E-09
7/22/2004	WT115	7	2aU	0.109	0.032	0.077	478.88	2.32E-03	0.0002	0.0001	0.0002	3.23E-09
7/22/2004	WT115	7	2bU	0.259	0.037	0.222	478.88	6.08E-03	0.1596	0.0009	0.1587	3.05E-06
7/22/2004	WT115	7	2cU	0.165	0.029	0.136	478.88	8.38E-03	0.0138	0.0004	0.0133	2.56E-07
7/22/2004	WT115	7	2dU	0.498	0.043	0.455	494.92	1.63E-02	0.3213	0.0022	0.3191	6.12E-06
7/22/2004	WT115	7	3pS	0.116	0.025	0.091	478.62	1.54E-03	0.0122	0.0012	0.0110	2.11E-07
7/22/2004	WT115	7	3aS	0.107	0.016	0.092	478.62	3.10E-03	0.0115	0.0009	0.0106	2.03E-07
7/22/2004	WT115	7	3bS	0.093	0.015	0.078	478.62	4.42E-03	0.0222	0.0007	0.0215	4.13E-07
7/22/2004	WT115	7	3cS	0.164	0.015	0.149	478.62	6.94E-03	0.0491	0.0006	0.0484	9.30E-07
7/22/2004	WT115	7	3dS	0.170	0.015	0.155	494.07	9.64E-03	0.0372	0.0007	0.0365	7.00E-07
7/22/2004	WT115	7	3pU	0.133	0.019	0.114	486.54	1.96E-03	0.0003	0.0000	0.0002	4.35E-09
7/22/2004	WT115	7	3aU	0.081	0.020	0.060	486.54	2.99E-03	0.0002	0.0001	0.0002	2.92E-09
7/22/2004	WT115	7	3bU	0.475	0.029	0.446	486.54	1.06E-02	0.1547	0.0005	0.1542	2.96E-06
7/22/2004	WT115	7	3cU	0.640	0.014	0.626	486.54	2.14E-02	0.4609	0.0047	0.4561	8.75E-06
7/22/2004	WT115	7	3dU	0.400	0.016	0.384	506.08	2.82E-02	0.0200	0.0012	0.0187	3.59E-07

Appendix B (continued)

Table 24 – Results for spike-corrected TSI erosion and ambient concentration, flow, PM-10 cumulative flux, individual PM-10 erosion and ambient net spike mass, and PM-10 net spike mass

Date	Site	Nominal Wind Erodibility Group	Run	spike-corrected TSI Avg erosion conc (mg/m^3)	Avg Tsi Ambient Conc (mg/m3)	concentration difference (mg/m3)	Q (ACFM)	Cumulative PM 10 Flux ton/(acre-hr) = flux in mg / (m2-min) x 1lb/454,000 mg x 1 ton/2000lb x (.305meter / ft)^2 x 43560 ft2/acre x 60 min/hr	Individual PM 10 erosion net spike mass (mg)	Individual PM 10 ambient net spike mass (mg)	Individual PM 10 net spike mass (mg)	PM 10 spike "pulse" (ton/acre)
7/28/2004	WT116	6	1pS	0.184	0.027	0.158	465.23	2.60E-03	0.0110	0.0002	0.0109	2.08E-07
7/28/2004	WT116	6	1aS	0.131	0.000	0.130	465.23	4.75E-03	0.0007	0.0002	0.0005	9.95E-09
7/28/2004	WT116	6	1bS	0.380	0.008	0.372	465.23	1.09E-02	0.3726	0.0075	0.3650	7.00E-06
7/28/2004	WT116	6	1cS	0.340	0.002	0.338	465.23	1.64E-02	0.6074	0.0018	0.6056	1.16E-05
7/28/2004	WT116	6	1dS	0.485	0.001	0.484	505.75	2.51E-02	0.2238	0.0010	0.2228	4.28E-06
7/28/2004	WT116	6	1pU	0.118	0.042	0.076	471.35	1.26E-03	0.0001	0.0000	0.0000	5.22E-10
7/28/2004	WT116	6	1aU	0.062	0.032	0.030	471.35	1.77E-03	0.0007	0.0003	0.0004	6.88E-09
7/28/2004	WT116	6	1bU	0.160	0.043	0.117	471.35	3.72E-03	0.0216	0.0010	0.0205	3.94E-07
7/28/2004	WT116	6	1cU	0.214	0.033	0.182	471.35	6.75E-03	0.1999	0.0026	0.1973	3.79E-06
7/28/2004	WT116	6	1dU	0.714	0.025	0.689	507.41	1.90E-02	0.1922	0.0023	0.1899	3.64E-06
7/28/2004	WT116	6	2pS	0.148	0.084	0.065	472.94	1.08E-03	0.0152	0.0014	0.0137	2.64E-07
7/28/2004	WT116	6	2aS	0.052	0.044	0.007	472.94	1.21E-03	0.0002	0.0000	0.0001	2.54E-09
7/28/2004	WT116	6	2bS	0.092	0.031	0.061	472.94	2.22E-03	0.0195	0.0034	0.0161	3.10E-07
7/28/2004	WT116	6	2cS	0.135	0.018	0.116	472.94	4.17E-03	0.1379	0.0020	0.1359	2.61E-06
7/28/2004	WT116	6	2dS	0.141	0.020	0.121	511.97	6.34E-03	0.0529	0.0020	0.0509	9.76E-07
7/28/2004	WT116	6	2pU	0.143	0.040	0.103	475.97	1.73E-03	0.0001	0.0000	0.0001	1.63E-09
7/28/2004	WT116	6	2aU	0.038	0.046	0.000	475.97	1.73E-03	0.0001	0.0000	0.0001	1.37E-09
7/28/2004	WT116	6	2bU	0.132	0.024	0.108	475.97	3.54E-03	0.0168	0.0003	0.0165	3.16E-07
7/28/2004	WT116	6	2cU	0.434	0.029	0.404	475.97	1.03E-02	0.1977	0.0008	0.1969	3.78E-06
7/28/2004	WT116	6	2dU	0.376	0.028	0.348	513.65	1.66E-02	0.4881	0.0046	0.4834	9.28E-06
7/28/2004	WT116	6	3pS	0.191	0.101	0.090	479.05	1.53E-03	0.0170	0.0063	0.0107	2.05E-07
7/28/2004	WT116	6	3aS	0.202	0.062	0.140	479.05	3.89E-03	0.0047	0.0001	0.0046	8.83E-08
7/28/2004	WT116	6	3bS	0.153	0.031	0.122	479.05	5.95E-03	0.1460	0.0077	0.1382	2.65E-06
7/28/2004	WT116	6	3cS	0.184	0.036	0.148	479.05	8.45E-03	0.1471	0.0016	0.1455	2.79E-06
7/28/2004	WT116	6	3dS	0.328	0.024	0.304	479.05	1.36E-02	0.0299	0.0008	0.0291	5.59E-07

Appendix B (continued)

Table 24 – Results for spike-corrected TSI erosion and ambient concentration, flow, PM-10 cumulative flux, individual PM-10 erosion and ambient net spike mass, and PM-10 net spike mass

Date	Site	Nominal Wind Erodibility Group	Run	spike-corrected TSI Avg erosion conc (mg/m^3)	Avg Tsi Ambient Conc (mg/m3)	concentration difference (mg/m3)	Q (ACFM)	Cumulative PM 10 Flux ton/(acre-hr) = flux in mg / (m2-min) x 1lb/454,000 mg x 1 ton/2000lb x (.305meter / ft)^2 x 43560 ft2/acre x 60 min/hr	Individual PM 10 erosion net spike mass (mg)	Individual PM 10 ambient net spike mass (mg)	Individual PM 10 net spike mass (mg)	PM 10 spike "pulse" (ton/acre)
7/27/2004	WT118	4.1	1pS	0.268	0.077	0.191	471.32	3.18E-03	0.0579	0.0042	0.0537	1.03E-06
7/27/2004	WT118	4.1	1aS	0.438	0.088	0.349	471.32	9.01E-03	0.0014	0.0001	0.0014	2.62E-08
7/27/2004	WT118	4.1	1bS	0.769	0.065	0.704	471.32	2.07E-02	0.8862	0.0080	0.8782	1.69E-05
7/27/2004	WT118	4.1	1pU	0.140	0.028	0.112	468.37	1.86E-03	0.0389	0.0010	0.0380	7.29E-07
7/27/2004	WT118	4.1	1aU	0.119	0.042	0.077	468.37	3.14E-03	0.0004	0.0004	0.0001	1.60E-09
7/27/2004	WT118	4.1	1bU	0.141	0.038	0.102	468.37	4.84E-03	0.0475	0.0000	0.0475	9.11E-07
7/27/2004	WT118	4.1	1cU	0.918	0.136	0.783	468.37	1.78E-02	0.4303	0.0009	0.4294	8.24E-06
7/27/2004	WT118	4.1	1dU	10.144	0.034	10.110	500.22	1.96E-01	2.0065	0.0021	2.0045	3.85E-05
7/27/2004	WT118	4.1	2pS	0.437	0.041	0.396	470.64	6.59E-03	0.0009	0.0001	0.0009	1.67E-08
7/27/2004	WT118	4.1	2aS	0.392	0.045	0.347	470.64	1.24E-02	0.0284	0.0008	0.0276	5.29E-07
7/27/2004	WT118	4.1	2bS	1.264	0.031	1.233	470.64	3.29E-02	2.0568	0.0042	2.0526	3.94E-05
7/27/2004	WT118	4.1	2cS	1.896	0.038	1.858	470.64	6.38E-02	1.2698	0.0035	1.2663	2.43E-05
7/27/2004	WT118	4.1	2dS	2.756	0.045	2.710	498.41	1.11E-01	0.6811	0.0056	0.6755	1.30E-05
7/27/2004	WT118	4.1	2pU	0.161	0.059	0.102	474.08	1.71E-03	0.0946	0.0036	0.0910	1.75E-06
7/27/2004	WT118	4.1	2aU	0.227	0.066	0.160	474.08	4.40E-03	0.0003	0.0001	0.0002	4.73E-09
7/27/2004	WT118	4.1	2bU	0.281	0.034	0.248	474.08	8.55E-03	0.2812	0.0036	0.2777	5.33E-06
7/27/2004	WT118	4.1	2cU	0.996	0.039	0.957	474.08	2.46E-02	0.4939	0.0026	0.4913	9.43E-06
7/27/2004	WT118	4.1	2dU	1.670	0.033	1.637	497.01	5.32E-02	0.8779	0.0127	0.8652	1.66E-05
7/27/2004	WT118	4.1	3pS	0.091	0.035	0.055	475.18	9.31E-04	0.0235	0.0005	0.0230	4.41E-07
7/27/2004	WT118	4.1	3aS	0.040	0.037	0.003	475.18	9.87E-04	0.0002	0.0001	0.0000	9.46E-10
7/27/2004	WT118	4.1	3bS	0.439	0.043	0.396	475.18	7.64E-03	0.1394	0.0042	0.1352	2.59E-06
7/27/2004	WT118	4.1	3cS	1.932	0.042	1.890	475.18	3.94E-02	1.8290	0.0438	1.7852	3.43E-05
7/27/2004	WT118	4.1	3dS	4.423	0.036	4.388	519.72	1.19E-01	2.4474	0.0040	2.4433	4.69E-05
7/27/2004	WT118	4.1	3pU	0.202	0.074	0.128	479.04	2.17E-03	0.0137	0.0023	0.0114	2.19E-07
7/27/2004	WT118	4.1	3aU	0.101	0.093	0.008	479.04	2.30E-03	0.0469	0.0197	0.0272	5.23E-07
7/27/2004	WT118	4.1	3bU	0.421	0.226	0.195	479.04	5.61E-03	0.0093	0.0066	0.0027	5.15E-08
7/27/2004	WT118	4.1	3cU	0.872	0.231	0.641	479.04	1.64E-02	0.3629	0.0018	0.3612	6.93E-06
7/27/2004	WT118	4.1	3dU	2.724	0.067	2.657	508.61	6.40E-02	1.3438	0.0032	1.3406	2.57E-05

Appendix B (continued)

Table 24 – Results for spike-corrected TSI erosion and ambient concentration, flow, PM-10 cumulative flux, individual PM-10 erosion and ambient net spike mass, and PM-10 net spike mass

Date	Site	Nominal Wind Erodibility Group	Run	spike-corrected TSI Avg erosion conc (mg/m^3)	Avg Tsi Ambient Conc (mg/m3)	concentration difference (mg/m3)	Q (ACFM)	Cumulative PM 10 Flux ton/(acre-hr) = flux in mg / (m2-min) x 1lb/454,000 mg x 1 ton/2000lb x (.305meter / ft)^2 x 43560 ft2/acre x 60 min/hr	Individual PM 10 erosion net spike mass (mg)	Individual PM 10 ambient net spike mass (mg)	Individual PM 10 net spike mass (mg)	PM 10 spike "pulse" (ton/acre)
8/2/2004	WT119	4.1	1pS	0.087	0.063	0.023	462.94	3.82E-04	0.0001	0.0002	0.0000	0.00E+00
8/2/2004	WT119	4.1	1aS	0.081	0.072	0.009	462.94	5.35E-04	0.0008	0.0003	0.0004	8.06E-09
8/2/2004	WT119	4.1	1bS	0.098	0.085	0.013	462.94	7.47E-04	0.0051	0.0038	0.0013	2.47E-08
8/2/2004	WT119	4.1	1cS	0.109	0.120	0.000	462.94	7.47E-04	0.0374	0.0056	0.0318	6.10E-07
8/2/2004	WT119	4.1	1dS	0.142	0.079	0.063	497.02	1.84E-03	0.0596	0.0074	0.0521	1.00E-06
8/2/2004	WT119	4.1	1pU	0.062	0.067	0.000	467.95	0.00E+00	0.0021	0.0032	0.0000	0.00E+00
8/2/2004	WT119	4.1	1aU	0.067	0.069	0.000	467.95	0.00E+00	0.0027	0.0012	0.0016	3.00E-08
8/2/2004	WT119	4.1	1bU	0.067	0.055	0.012	467.95	2.03E-04	0.0136	0.0027	0.0109	2.09E-07
8/2/2004	WT119	4.1	1cU	0.132	0.056	0.076	467.95	1.46E-03	0.0732	0.0130	0.0602	1.16E-06
8/2/2004	WT119	4.1	1dU	0.299	0.049	0.250	467.95	5.60E-03	0.1126	0.0049	0.1076	2.07E-06
8/2/2004	WT119	4.1	2pS	0.054	0.051	0.003	480.79	5.10E-05	0.0020	0.0017	0.0003	5.25E-09
8/2/2004	WT119	4.1	2aS	0.044	0.064	0.000	480.79	5.10E-05	0.0002	0.0002	0.0000	1.63E-10
8/2/2004	WT119	4.1	2bS	0.050	0.075	0.000	480.79	5.10E-05	0.0096	0.0024	0.0072	1.38E-07
8/2/2004	WT119	4.1	2cS	0.059	0.031	0.028	480.79	5.28E-04	0.0259	0.0032	0.0227	4.36E-07
8/2/2004	WT119	4.1	2dS	0.105	0.069	0.035	511.88	1.16E-03	0.0170	0.0029	0.0141	2.71E-07
8/2/2004	WT119	4.1	2pU	0.055	0.075	0.000	481.53	0.00E+00	0.0001	0.0001	0.0000	0.00E+00
8/2/2004	WT119	4.1	2aU	0.069	0.044	0.025	481.53	4.20E-04	0.0001	0.0001	0.0001	1.04E-09
8/2/2004	WT119	4.1	2bU	0.148	0.048	0.100	481.53	2.13E-03	0.0671	0.0021	0.0650	1.25E-06
8/2/2004	WT119	4.1	2cU	0.385	0.066	0.319	481.53	7.55E-03	0.2080	0.0038	0.2042	3.92E-06
8/2/2004	WT119	4.1	2dU	1.036	0.051	0.985	515.38	2.54E-02	0.1922	0.0055	0.1867	3.58E-06
8/2/2004	WT119	4.1	3pS	0.072	0.089	0.000	480.21	0.00E+00	0.0025	0.0024	0.0002	3.03E-09
8/2/2004	WT119	4.1	3aS	0.106	0.053	0.053	480.21	9.01E-04	0.0052	0.0027	0.0025	4.74E-08
8/2/2004	WT119	4.1	3bS	0.079	0.111	0.000	480.21	9.01E-04	0.0002	0.0001	0.0001	2.68E-09
8/2/2004	WT119	4.1	3cS	0.118	0.035	0.083	480.21	2.30E-03	0.0810	0.0078	0.0732	1.40E-06
8/2/2004	WT119	4.1	3dS	0.228	0.045	0.183	501.43	5.54E-03	0.0781	0.0058	0.0724	1.39E-06
8/2/2004	WT119	4.1	3pU	0.137	0.066	0.071	476.71	1.19E-03	0.0002	0.0003	0.0000	0.00E+00
8/2/2004	WT119	4.1	3aU	0.079	0.069	0.010	476.71	1.35E-03	0.0002	0.0001	0.0001	2.84E-09
8/2/2004	WT119	4.1	3bU	0.581	0.177	0.404	476.71	8.16E-03	0.0994	0.0013	0.0981	1.88E-06
8/2/2004	WT119	4.1	3cU	0.981	0.195	0.785	476.71	2.14E-02	0.4551	0.0014	0.4537	8.71E-06
8/2/2004	WT119	4.1	3dU	1.848	0.128	1.721	512.32	5.24E-02	1.2515	0.0229	1.2286	2.36E-05

Appendix B (continued)

Table 24 – Results for spike-corrected TSI erosion and ambient concentration, flow, PM-10 cumulative flux, individual PM-10 erosion and ambient net spike mass, and PM-10 net spike mass

Date	Site	Nominal Wind Erodibility Group	Run	spike-corrected TSI Avg erosion conc (mg/m^3)	Avg Tsi Ambient Conc (mg/m3)	concentration difference (mg/m3)	Q (ACFM)	Cumulative PM 10 Flux ton/(acre-hr) = flux in mg / (m2-min) x 1lb/454,000 mg x 1 ton/2000lb x (.305meter / ft)^2 x 43560 ft2/acre x 60 min/hr	Individual PM 10 erosion net spike mass (mg)	Individual PM 10 ambient net spike mass (mg)	Individual PM 10 net spike mass (mg)	PM 10 spike "pulse" (ton/acre)
8/3/2004	WT121	5	1pS	0.097	0.114	0.000	472.49	0.00E+00	0.0122	0.0096	0.0026	5.07E-08
8/3/2004	WT121	5	1aS	0.065	0.123	0.000	472.49	0.00E+00	0.0002	0.0002	0.0001	1.17E-09
8/3/2004	WT121	5	1bS	0.098	0.088	0.010	472.49	1.75E-04	0.0249	0.0037	0.0213	4.08E-07
8/3/2004	WT121	5	1cS	0.131	0.052	0.078	472.49	1.49E-03	0.0573	0.0021	0.0552	1.06E-06
8/3/2004	WT121	5	1dS	0.220	0.061	0.159	508.32	4.33E-03	0.1241	0.0054	0.1188	2.28E-06
8/3/2004	WT121	5	1pU	0.090	0.048	0.042	474.89	7.06E-04	0.0038	0.0006	0.0032	6.13E-08
8/3/2004	WT121	5	1aU	0.129	0.096	0.033	474.89	1.27E-03	0.0014	0.0006	0.0008	1.52E-08
8/3/2004	WT121	5	1bU	0.211	0.091	0.121	474.89	3.29E-03	0.0490	0.0020	0.0469	9.01E-07
8/3/2004	WT121	5	1cU	0.566	0.061	0.504	474.89	1.18E-02	0.5416	0.0126	0.5289	1.02E-05
8/3/2004	WT121	5	1dU	1.443	0.103	1.340	477.82	3.44E-02	2.1925	0.0040	2.1886	4.20E-05
8/3/2004	WT121	5	2pS	0.132	0.047	0.085	480.38	1.44E-03	0.0003	0.0000	0.0003	5.77E-09
8/3/2004	WT121	5	2aS	0.108	0.053	0.055	480.38	2.37E-03	0.0006	0.0002	0.0005	8.81E-09
8/3/2004	WT121	5	2bS	0.099	0.100	0.000	480.38	2.37E-03	0.0296	0.0038	0.0257	4.94E-07
8/3/2004	WT121	5	2cS	1.126	0.049	1.077	480.38	2.06E-02	0.1227	0.0028	0.1199	2.30E-06
8/3/2004	WT121	5	2dS	1.820	0.110	1.710	513.55	5.15E-02	0.2317	0.0021	0.2295	4.40E-06
8/3/2004	WT121	5	2pU	0.212	0.052	0.160	482.69	2.72E-03	0.0004	0.0001	0.0003	5.25E-09
8/3/2004	WT121	5	2aU	0.058	0.042	0.016	482.69	3.00E-03	0.0004	0.0001	0.0003	5.71E-09
8/3/2004	WT121	5	2bU	0.397	0.038	0.359	482.69	9.12E-03	0.0770	0.0037	0.0732	1.40E-06
8/3/2004	WT121	5	2cU	1.558	0.066	1.492	482.69	3.45E-02	0.9365	0.0033	0.9332	1.79E-05
8/3/2004	WT121	5	2dU	7.083	0.086	6.997	509.59	1.60E-01	3.3765	0.0125	3.3639	6.46E-05
8/3/2004	WT121	5	3pS	0.107	0.077	0.029	484.51	5.04E-04	0.0001	0.0000	0.0000	9.79E-11
8/3/2004	WT121	5	3aS	0.052	0.035	0.017	484.51	7.94E-04	0.0002	0.0001	0.0001	2.61E-09
8/3/2004	WT121	5	3bS	0.288	0.094	0.194	484.51	4.10E-03	0.1091	0.0018	0.1073	2.06E-06
8/3/2004	WT121	5	3cS	0.637	0.083	0.553	484.51	1.36E-02	0.3368	0.0066	0.3302	6.34E-06
8/3/2004	WT121	5	3dS	0.345	0.166	0.179	507.94	1.68E-02	0.0547	0.0023	0.0524	1.01E-06
7/13/2004	WT121	5	3pU	0.848	0.137	0.710	482.28	1.21E-02	0.0007	0.0001	0.0007	1.26E-08
8/3/2004	WT121	5	3aU	1.374	0.251	1.123	482.28	3.12E-02	0.0943	0.0360	0.0583	1.12E-06
8/3/2004	WT121	5	3bU	0.603	0.047	0.557	482.28	4.07E-02	0.6557	0.0034	0.6523	1.25E-05
8/3/2004	WT121	5	3cU	4.180	0.057	4.123	482.28	1.11E-01	0.3334	0.0015	0.3320	6.37E-06
8/3/2004	WT121	5	3dU	1.467	0.315	1.152	508.87	1.32E-01	0.6334	0.0054	0.6280	1.21E-05

Appendix B (continued)

Table 24 – Results for spike-corrected TSI erosion and ambient concentration, flow, PM-10 cumulative flux, individual PM-10 erosion and ambient net spike mass, and PM-10 net spike mass

Date	Site	Nominal Wind Erodibility Group	Run	spike-corrected TSI Avg erosion conc (mg/m^3)	Avg Tsi Ambient Conc (mg/m3)	concentration difference (mg/m3)	Q (ACFM)	Cumulative PM 10 Flux ton/(acre-hr) = flux in mg / (m2-min) x 1lb/454,000 mg x 1 ton/2000lb x (.305meter / ft)^2 x 43560 ft2/acre x 60 min/hr	Individual PM 10 erosion net spike mass (mg)	Individual PM 10 ambient net spike mass (mg)	Individual PM 10 net spike mass (mg)	PM 10 spike "pulse" (ton/acre)
7/13/2004	WT122	8	1pS	0.172	0.134	0.038	475.01	6.32E-04	0.0057	0.0014	0.0043	8.34E-08
7/13/2004	WT122	8	1aS	0.138	0.137	0.001	475.01	6.49E-04	0.0005	0.0003	0.0003	5.12E-09
7/13/2004	WT122	8	1bS	0.702	0.135	0.567	477.23	1.02E-02	0.0167	0.0026	0.0141	2.71E-07
7/13/2004	WT122	8	1cS	0.648	0.131	0.517	477.23	1.89E-02	0.5228	0.0120	0.5108	9.80E-06
7/13/2004	WT122	8	1pU	0.200	0.133	0.068	478.34	1.14E-03	0.0011	0.0002	0.0009	1.73E-08
7/13/2004	WT122	8	1aU	0.149	0.134	0.015	478.34	1.41E-03	0.1492	0.0032	0.1460	2.80E-06
7/13/2004	WT122	8	1bU	0.124	0.121	0.003	481.31	1.46E-03	0.1241	0.0032	0.1209	2.32E-06
7/13/2004	WT122	8	1cU	0.311	0.112	0.199	481.31	4.85E-03	0.3113	0.0058	0.3055	5.86E-06
7/13/2004	WT122	8	1dU	1.510	0.115	1.395	481.31	2.86E-02	1.5099	0.0091	1.5008	2.88E-05
7/13/2004	WT122	8	2pS	0.375	0.109	0.265	479.08	4.49E-03	0.0009	0.0002	0.0007	1.33E-08
7/13/2004	WT122	8	2aS	0.113	0.107	0.006	479.08	4.60E-03	0.1133	0.0006	0.1126	2.16E-06
7/13/2004	WT122	8	2bS	0.097	0.096	0.001	479.83	4.62E-03	0.0966	0.0004	0.0962	1.85E-06
7/13/2004	WT122	8	2cS	0.213	0.111	0.102	479.83	6.34E-03	0.2128	0.0020	0.2108	4.05E-06
7/13/2004	WT122	8	2dS	1.436	0.121	1.315	501.62	2.96E-02	1.4360	0.0101	1.4259	2.74E-05
7/13/2004	WT122	8	2pU	0.174	0.123	0.052	405.77	7.49E-04	0.0040	0.0019	0.0021	4.02E-08
7/13/2004	WT122	8	2aU	0.139	0.124	0.015	477.02	1.01E-03	0.0005	0.0008	0.0000	0.00E+00
7/13/2004	WT122	8	2bU	0.191	0.114	0.076	477.02	2.29E-03	0.0306	0.0084	0.0222	4.26E-07
7/13/2004	WT122	8	2cU	0.297	0.119	0.178	477.02	5.29E-03	0.1763	0.0066	0.1697	3.26E-06
7/13/2004	WT122	8	2dU	0.686	0.156	0.530	500.86	1.46E-02	0.4634	0.0075	0.4559	8.75E-06
7/13/2004	WT122	8	3pS	0.133	0.106	0.027	480.05	4.63E-04	0.0086	0.0009	0.0077	1.48E-07
7/13/2004	WT122	8	3aS	0.113	0.081	0.033	480.05	1.02E-03	0.0007	0.0002	0.0004	8.48E-09
7/13/2004	WT122	8	3bS	0.097	0.296	0.000	479.31	1.02E-03	0.0005	0.0012	0.0000	0.00E+00
7/13/2004	WT122	8	3cS	0.213	0.078	0.135	479.31	3.29E-03	0.0567	0.0007	0.0560	1.07E-06
7/13/2004	WT122	8	3dS	1.436	0.122	1.314	479.31	2.55E-02	1.2144	0.0030	1.2113	2.32E-05
7/13/2004	WT122	8	3pU	0.101	0.158	0.000	483.13	0.00E+00	0.0005	0.0003	0.0002	4.44E-09
7/13/2004	WT122	8	3aU	0.091	0.176	0.000	483.13	0.00E+00	0.0116	0.0021	0.0095	1.83E-07
7/13/2004	WT122	8	3bU	0.087	0.059	0.029	482.38	4.88E-04	0.0001	0.0001	0.0000	5.87E-10
7/13/2004	WT122	8	3cU	0.379	0.076	0.303	482.38	5.66E-03	0.0258	0.0016	0.0241	4.63E-07
7/13/2004	WT122	8	3dU	1.165	0.074	1.091	482.87	2.43E-02	0.4532	0.0013	0.4519	8.67E-06

Appendix B (continued)

Table 24 – Results for spike-corrected TSI erosion and ambient concentration, flow, PM-10 cumulative flux, individual PM-10 erosion and ambient net spike mass, and PM-10 net spike mass

Date	Site	Nominal Wind Erodibility Group	Run	spike-corrected TSI Avg erosion conc (mg/m^3)	Avg Tsi Ambient Conc (mg/m3)	concentration difference (mg/m3)	Q (ACFM)	Cumulative PM 10 Flux ton/(acre-hr) = flux in mg / (m2-min) x 1lb/454,000 mg x 1 ton/2000lb x (.305meter / ft)^2 x 43560 ft2/acre x 60 min/hr	Individual PM 10 erosion net spike mass (mg)	Individual PM 10 ambient net spike mass (mg)	Individual PM 10 net spike mass (mg)	PM 10 spike "pulse" (ton/acre)
7/30/2004	WT123	5	1pS	0.218	0.213	0.005	461.12	7.50E-05	0.0119	0.0131	0.0000	0.00E+00
7/30/2004	WT123	5	1aS	0.191	0.198	0.000	461.12	7.50E-05	0.0044	0.0012	0.0032	6.10E-08
7/30/2004	WT123	5	1bS	0.162	0.153	0.009	461.12	2.19E-04	0.0237	0.0106	0.0132	2.52E-07
7/30/2004	WT123	5	1cS	0.358	0.157	0.200	461.12	3.49E-03	0.1680	0.0175	0.1505	2.89E-06
7/30/2004	WT123	5	1dS	0.406	0.151	0.255	503.82	8.01E-03	0.3661	0.0322	0.3339	6.41E-06
7/30/2004	WT123	5	1pU	0.217	0.141	0.076	467.45	1.26E-03	0.0004	0.0005	0.0000	0.00E+00
7/30/2004	WT123	5	1aU	0.134	0.124	0.009	467.45	1.41E-03	0.0015	0.0024	0.0000	0.00E+00
7/30/2004	WT123	5	1bU	0.204	0.070	0.134	467.45	3.64E-03	0.0063	0.0026	0.0036	6.95E-08
7/30/2004	WT123	5	1cU	0.230	0.101	0.129	467.45	5.77E-03	0.0438	0.0051	0.0387	7.42E-07
7/30/2004	WT123	5	1dU	0.815	0.149	0.665	467.45	1.68E-02	0.2394	0.0029	0.2366	4.54E-06
7/30/2004	WT123	5	2pS	0.146	0.148	0.000	469.99	0.00E+00	0.0021	0.0005	0.0016	3.12E-08
7/30/2004	WT123	5	2aS	0.116	0.111	0.005	469.99	7.68E-05	0.0052	0.0016	0.0037	7.02E-08
7/30/2004	WT123	5	2bS	0.113	0.099	0.014	469.99	3.10E-04	0.0149	0.0040	0.0109	2.10E-07
7/30/2004	WT123	5	2cS	0.540	0.071	0.469	469.99	8.11E-03	0.1403	0.0044	0.1360	2.61E-06
7/30/2004	WT123	5	2dS	0.866	0.069	0.797	509.10	2.24E-02	1.5435	0.0257	1.5178	2.91E-05
7/30/2004	WT123	5	2pU	0.275	0.060	0.215	473.33	3.59E-03	0.0088	0.0016	0.0073	1.40E-07
7/30/2004	WT123	5	2aU	0.315	0.049	0.266	473.33	8.04E-03	0.0022	0.0006	0.0016	2.98E-08
7/30/2004	WT123	5	2bU	0.459	0.029	0.429	473.33	1.52E-02	0.1162	0.0013	0.1149	2.20E-06
7/30/2004	WT123	5	2cU	1.041	0.028	1.014	473.33	3.22E-02	0.3227	0.0012	0.3214	6.17E-06
7/30/2004	WT123	5	2dU	1.134	0.030	1.104	505.91	5.18E-02	0.3587	0.0019	0.3567	6.85E-06
7/30/2004	WT123	5	3pS	0.364	0.042	0.322	476.40	5.41E-03	0.0299	0.0014	0.0284	5.46E-07
7/30/2004	WT123	5	3aS	0.091	0.041	0.051	476.40	6.27E-03	0.0003	0.0001	0.0002	4.70E-09
7/30/2004	WT123	5	3bS	0.158	0.033	0.125	476.40	8.37E-03	0.0019	0.0005	0.0013	2.55E-08
7/30/2004	WT123	5	3cS	0.634	0.032	0.602	476.40	1.85E-02	0.3280	0.0020	0.3260	6.26E-06
7/30/2004	WT123	5	3dS	1.689	0.041	1.649	515.37	4.83E-02	1.0841	0.0014	1.0827	2.08E-05
7/30/2004	WT123	5	3pU	0.162	0.080	0.082	478.94	1.39E-03	0.0009	0.0001	0.0007	1.38E-08
7/30/2004	WT123	5	3aU	0.091	0.051	0.039	478.94	2.05E-03	0.0001	0.0001	0.0001	1.24E-09
7/30/2004	WT123	5	3bU	0.124	0.051	0.073	478.94	3.29E-03	0.0412	0.0030	0.0382	7.34E-07
7/30/2004	WT123	5	3cU	0.356	0.099	0.257	478.94	7.64E-03	0.2022	0.0033	0.1989	3.82E-06
7/30/2004	WT123	5	3dU	2.802	0.236	2.566	508.85	5.35E-02	0.9265	0.0201	0.9064	1.74E-05

Appendix B (continued)

Table 24 – Results for spike-corrected TSI erosion and ambient concentration, flow, PM-10 cumulative flux, individual PM-10 erosion and ambient net spike mass, and PM-10 net spike mass

Date	Site	Nominal Wind Erodibility Group	Run	spike-corrected TSI Avg erosion conc (mg/m^3)	Avg Tsi Ambient Conc (mg/m3)	concentration difference (mg/m3)	Q (ACFM)	Cumulative PM 10 Flux ton/(acre-hr) = flux in mg / (m2-min) x 1lb/454,000 mg x 1 ton/2000lb x (.305meter / ft)^2 x 43560 ft2/acre x 60 min/hr	Individual PM 10 erosion net spike mass (mg)	Individual PM 10 ambient net spike mass (mg)	Individual PM 10 net spike mass (mg)	PM 10 spike "pulse" (ton/acre)
8/4/2004	WT124	8	1pS	0.147	0.272	0.000	461.35	0.00E+00	0.0452	0.0171	0.0281	5.40E-07
8/4/2004	WT124	8	1aS	0.062	0.073	0.000	461.35	0.00E+00	0.0054	0.0059	0.0000	0.00E+00
8/4/2004	WT124	8	1bS	0.080	0.081	0.000	461.35	0.00E+00	0.0071	0.0108	0.0000	0.00E+00
8/4/2004	WT124	8	1cS	0.070	0.107	0.000	461.35	0.00E+00	0.0123	0.0047	0.0075	1.44E-07
8/4/2004	WT124	8	1dS	0.102	0.063	0.040	494.54	6.89E-04	0.0153	0.0074	0.0080	1.53E-07
8/4/2004	WT124	8	1pU	0.092	0.060	0.032	466.33	5.35E-04	0.0002	0.0001	0.0001	2.74E-09
8/4/2004	WT124	8	1aU	0.057	0.049	0.008	466.33	6.66E-04	0.0035	0.0030	0.0004	8.16E-09
8/4/2004	WT124	8	1bU	0.088	0.048	0.040	466.33	1.33E-03	0.0506	0.0046	0.0460	8.82E-07
8/4/2004	WT124	8	1cU	0.213	0.043	0.170	466.33	4.13E-03	0.1134	0.0025	0.1110	2.13E-06
8/4/2004	WT124	8	1dU	0.281	0.059	0.223	501.23	8.05E-03	0.0414	0.0030	0.0384	7.37E-07
8/4/2004	WT124	8	2pS	0.133	0.103	0.030	469.79	5.00E-04	0.0059	0.0021	0.0038	7.26E-08
8/4/2004	WT124	8	2aS	0.078	0.086	0.000	469.79	5.00E-04	0.0045	0.0026	0.0020	3.80E-08
8/4/2004	WT124	8	2bS	0.060	0.042	0.017	469.79	7.86E-04	0.0214	0.0040	0.0174	3.34E-07
8/4/2004	WT124	8	2cS	0.105	0.091	0.014	469.79	1.01E-03	0.0292	0.0051	0.0240	4.61E-07
8/4/2004	WT124	8	2dS	0.100	0.056	0.044	502.81	1.80E-03	0.0167	0.0105	0.0062	1.19E-07
8/4/2004	WT124	8	2pU	0.067	0.065	0.003	473.53	4.52E-05	0.0001	0.0005	0.0000	0.00E+00
8/4/2004	WT124	8	3pS	0.077	0.047	0.030	475.92	5.09E-04	0.0003	0.0001	0.0003	5.06E-09
8/4/2004	WT124	8	3aS	0.101	0.054	0.048	475.92	1.31E-03	0.0013	0.0009	0.0004	7.99E-09
8/4/2004	WT124	8	3bS	0.131	0.049	0.082	475.92	2.69E-03	0.0404	0.0020	0.0384	7.37E-07
8/4/2004	WT124	8	3cS	0.370	0.071	0.298	475.92	7.70E-03	0.1615	0.0057	0.1558	2.99E-06
8/4/2004	WT124	8	3dS	0.167	0.069	0.098	499.71	9.42E-03	0.0078	0.0012	0.0066	1.27E-07
8/4/2004	WT124	8	3pU	0.136	0.048	0.088	476.99	1.48E-03	0.0001	0.0000	0.0000	3.59E-10
8/4/2004	WT124	8	3aU	0.159	0.059	0.099	476.99	3.15E-03	0.0004	0.0001	0.0003	6.36E-09
8/4/2004	WT124	8	3bU	0.176	0.038	0.138	476.99	5.48E-03	0.0323	0.0021	0.0302	5.79E-07
8/4/2004	WT124	8	3cU	0.520	0.044	0.477	476.99	1.35E-02	0.3483	0.0020	0.3463	6.65E-06
8/4/2004	WT124	8	3dU	0.390	0.039	0.350	512.91	1.98E-02	0.0126	0.0016	0.0110	2.11E-07

Appendix B (continued)

Table 24 – Results for spike-corrected TSI erosion and ambient concentration, flow, PM-10 cumulative flux, individual PM-10 erosion and ambient net spike mass, and PM-10 net spike mass

Date	Site	Nominal Wind Erodibility Group	Run	spike-corrected TSI Avg erosion conc (mg/m^3)	Avg Tsi Ambient Conc (mg/m3)	concentration difference (mg/m3)	Q (ACFM)	Cumulative PM 10 Flux ton/(acre-hr) = flux in mg / (m2-min) x 1lb/454,000 mg x 1 ton/2000lb x (.305meter / ft)^2 x 43560 ft2/acre x 60 min/hr	Individual PM 10 erosion net spike mass (mg)	Individual PM 10 ambient net spike mass (mg)	Individual PM 10 net spike mass (mg)	PM 10 spike "pulse" (ton/acre)
8/23/2004	WT125	3	1pS	0.273	0.109	0.165	459.82	2.68E-03	0.0013	0.0000	0.0012	2.32E-08
8/23/2004	WT125	3	1aS	0.308	0.079	0.229	459.82	6.41E-03	0.0004	0.0008	0.0000	0.00E+00
8/23/2004	WT125	3	1bS	0.944	0.062	0.883	459.82	2.08E-02	0.3141	0.0069	0.3072	5.89E-06
8/23/2004	WT125	3	1cS	0.711	0.046	0.664	459.82	3.16E-02	0.5703	0.0065	0.5638	1.08E-05
8/23/2004	WT125	3	1dS	1.069	0.049	1.020	499.76	4.96E-02	0.1272	0.0044	0.1228	2.36E-06
8/23/2004	WT125	3	1pU	0.432	0.071	0.361	462.31	5.90E-03	0.0274	0.0018	0.0256	4.92E-07
8/23/2004	WT125	3	1aU	0.083	0.041	0.043	462.31	6.60E-03	0.0002	0.0001	0.0001	2.45E-09
8/23/2004	WT125	3	1bU	0.071	0.033	0.038	462.31	7.22E-03	0.0071	0.0009	0.0061	1.18E-07
8/23/2004	WT125	3	1cU	0.764	0.043	0.721	462.31	1.90E-02	0.2920	0.0062	0.2858	5.48E-06
8/23/2004	WT125	3	1dU	4.443	0.089	4.354	488.83	9.41E-02	0.4444	0.0108	0.4336	8.32E-06
8/23/2004	WT125	3	2pS	0.285	0.084	0.200	463.30	3.29E-03	0.0192	0.0004	0.0189	3.62E-07
8/23/2004	WT125	3	2aS	0.182	0.090	0.092	463.30	4.80E-03	0.0016	0.0010	0.0006	1.15E-08
8/23/2004	WT125	3	2bS	0.380	0.071	0.309	463.30	9.86E-03	0.3288	0.0096	0.3191	6.12E-06
8/23/2004	WT125	3	2cS	0.684	0.050	0.634	463.30	2.03E-02	0.1304	0.0015	0.1289	2.47E-06
8/23/2004	WT125	3	2dS	1.090	0.085	1.005	505.82	3.81E-02	0.0474	0.0027	0.0447	8.58E-07
8/23/2004	WT125	3	2pU	0.128	0.118	0.010	465.62	1.61E-04	0.0397	0.0106	0.0291	5.59E-07
8/23/2004	WT125	3	2aU	0.247	0.107	0.140	465.62	2.47E-03	0.0166	0.0047	0.0119	2.29E-07
8/23/2004	WT125	3	2bU	0.464	0.099	0.365	465.62	8.49E-03	0.2213	0.0101	0.2112	4.05E-06
8/23/2004	WT125	3	2cU	0.741	0.043	0.698	465.62	2.00E-02	0.9047	0.0066	0.8980	1.72E-05
8/23/2004	WT125	3	2dU	1.992	0.091	1.901	508.35	5.40E-02	1.1125	0.0117	1.1008	2.11E-05
8/23/2004	WT125	3	3pS	0.571	0.227	0.344	466.15	5.68E-03	0.0503	0.0173	0.0330	6.33E-07
8/23/2004	WT125	3	3aS	0.608	0.116	0.493	466.15	1.38E-02	0.0125	0.0059	0.0065	1.25E-07
8/23/2004	WT125	3	3bS	1.705	0.086	1.619	466.15	4.05E-02	0.3374	0.0047	0.3327	6.38E-06
8/23/2004	WT125	3	3cS	2.236	0.067	2.168	466.15	7.63E-02	0.5075	0.0033	0.5042	9.68E-06
8/23/2004	WT125	3	3dS	0.906	0.152	0.754	466.15	8.88E-02	0.1121	0.0129	0.0992	1.90E-06
8/23/2004	WT125	3	3pU	0.449	0.197	0.252	465.67	4.15E-03	0.0003	0.0000	0.0003	5.68E-09
8/23/2004	WT125	3	3aU	0.188	0.100	0.087	465.67	5.59E-03	0.0130	0.0029	0.0101	1.94E-07
8/23/2004	WT125	3	3bU	0.516	0.115	0.401	465.67	1.22E-02	0.0308	0.0031	0.0278	5.33E-07
8/23/2004	WT125	3	3cU	1.347	0.189	1.159	465.67	3.13E-02	0.1981	0.0064	0.1917	3.68E-06
8/23/2004	WT125	3	3dU	2.568	0.172	2.396	495.79	7.32E-02	1.3366	0.0150	1.3216	2.54E-05

Appendix B (continued)

Table 24 – Results for spike-corrected TSI erosion and ambient concentration, flow, PM-10 cumulative flux, individual PM-10 erosion and ambient net spike mass, and PM-10 net spike mass

Date	Site	Nominal Wind Erodibility Group	Run	spike-corrected TSI Avg erosion conc (mg/m^3)	Avg Tsi Ambient Conc (mg/m3)	concentration difference (mg/m3)	Q (ACFM)	Cumulative PM 10 Flux ton/(acre-hr) = flux in mg / (m2-min) x 1lb/454,000 mg x 1 ton/2000lb x (.305meter / ft)^2 x 43560 ft2/acre x 60 min/hr	Individual PM 10 erosion net spike mass (mg)	Individual PM 10 ambient net spike mass (mg)	Individual PM 10 net spike mass (mg)	PM 10 spike "pulse" (ton/acre)
7/19/2004	WT126	2	1pS	0.490	0.348	0.142	469.88	2.36E-03	0.0004	0.0006	0.0000	0.00E+00
7/19/2004	WT126	2	1aS	0.312	0.344	0.000	469.88	2.36E-03	0.0240	0.0280	0.0000	0.00E+00
7/19/2004	WT126	2	1bS	0.322	0.357	0.000	469.88	2.36E-03	0.0973	0.0215	0.0758	1.45E-06
7/19/2004	WT126	2	1cS	0.290	0.286	0.004	469.88	2.42E-03	0.1187	0.0305	0.0882	1.69E-06
7/19/2004	WT126	2	1dS	0.514	0.406	0.108	498.72	4.32E-03	0.0626	0.0140	0.0487	9.34E-07
7/19/2004	WT126	2	1pU	0.279	0.427	0.000	470.20	0.00E+00	0.0004	0.0007	0.0000	0.00E+00
7/19/2004	WT126	2	1aU	0.390	0.438	0.000	470.20	0.00E+00	0.0386	0.0268	0.0118	2.26E-07
7/19/2004	WT126	2	1bU	0.571	0.358	0.213	470.20	3.54E-03	0.1294	0.0183	0.1111	2.13E-06
7/19/2004	WT126	2	1cU	0.984	0.451	0.533	470.20	1.24E-02	1.0757	0.0462	1.0295	1.98E-05
7/19/2004	WT126	2	1dU	2.469	0.529	1.940	497.78	4.64E-02	1.8364	0.0558	1.7806	3.42E-05
7/19/2004	WT126	2	2pS	0.202	0.246	0.000	475.15	0.00E+00	0.0008	0.0004	0.0004	6.85E-09
7/19/2004	WT126	2	2aS	0.116	0.105	0.011	475.15	1.85E-04	0.0005	0.0039	0.0000	0.00E+00
7/19/2004	WT126	2	2bS	0.343	0.128	0.215	475.15	3.79E-03	0.0890	0.0026	0.0864	1.66E-06
7/19/2004	WT126	2	2cS	0.899	0.154	0.746	475.15	1.63E-02	0.6983	0.0103	0.6879	1.32E-05
7/19/2004	WT126	2	2dS	2.999	0.133	2.866	505.10	6.72E-02	0.6275	0.0039	0.6236	1.20E-05
7/19/2004	WT126	2	2pU	0.295	0.294	0.001	476.75	2.30E-05	0.0004	0.0005	0.0000	0.00E+00
7/19/2004	WT126	2	2aU	0.321	0.374	0.000	476.75	2.30E-05	0.0154	0.0101	0.0054	1.03E-07
7/19/2004	WT126	2	2bU	0.210	0.137	0.073	476.75	1.25E-03	0.0359	0.0051	0.0308	5.91E-07
7/19/2004	WT126	2	2cU	0.554	0.125	0.429	476.75	8.48E-03	0.3786	0.0060	0.3727	7.15E-06
7/19/2004	WT126	2	2dU	1.295	0.157	1.137	476.75	2.76E-02	1.4603	0.0290	1.4313	2.75E-05
7/19/2004	WT126	2	3pS	0.357	0.170	0.188	479.83	3.18E-03	0.0018	0.0003	0.0015	2.95E-08
7/19/2004	WT126	2	3aS	0.181	0.176	0.005	479.83	3.26E-03	0.0119	0.0063	0.0056	1.08E-07
7/19/2004	WT126	2	3bS	0.555	0.141	0.413	479.83	1.03E-02	0.5044	0.0376	0.4668	8.96E-06
7/19/2004	WT126	2	3cS	1.133	0.154	0.980	479.83	2.69E-02	1.0125	0.0077	1.0048	1.93E-05
7/19/2004	WT126	2	3dS	1.492	0.273	1.219	505.16	4.85E-02	0.3402	0.0214	0.3188	6.12E-06
7/19/2004	WT126	2	3pU	0.481	0.172	0.309	481.64	5.25E-03	0.0010	0.0003	0.0007	1.39E-08
7/19/2004	WT126	2	3aU	0.349	0.122	0.228	481.64	9.12E-03	0.0180	0.0176	0.0004	7.37E-09
7/19/2004	WT126	2	3bU	1.078	0.146	0.932	481.64	2.50E-02	0.1226	0.0026	0.1200	2.30E-06
7/19/2004	WT126	2	3cU	1.716	0.145	1.571	481.64	5.17E-02	0.8972	0.0178	0.8794	1.69E-05
7/19/2004	WT126	2	3dU	1.841	0.226	1.616	508.48	8.06E-02	1.5843	0.0798	1.5046	2.89E-05

Appendix B (continued)

Table 24 – Results for spike-corrected TSI erosion and ambient concentration, flow, PM-10 cumulative flux, individual PM-10 erosion and ambient net spike mass, and PM-10 net spike mass

Date	Site	Nominal Wind Erodibility Group	Run	spike-corrected TSI Avg erosion conc (mg/m^3)	Avg Tsi Ambient Conc (mg/m3)	concentration difference (mg/m3)	Q (ACFM)	Cumulative PM 10 Flux ton/(acre-hr) = flux in mg / (m2-min) x 1lb/454,000 mg x 1 ton/2000lb x (.305meter / ft)^2 x 43560 ft2/acre x 60 min/hr	Individual PM 10 erosion net spike mass (mg)	Individual PM 10 ambient net spike mass (mg)	Individual PM 10 net spike mass (mg)	PM 10 spike "pulse" (ton/acre)
7/15/2004	WT127	2	1pS	0.143	0.043	0.100	472.90	1.67E-03	0.0002	0.0001	0.0002	3.00E-09
7/15/2004	WT127	2	1aS	0.119	0.050	0.069	472.90	2.83E-03	0.0002	0.0001	0.0001	2.15E-09
7/15/2004	WT127	2	1bS	0.111	0.046	0.065	472.90	3.92E-03	0.0056	0.0006	0.0050	9.55E-08
7/15/2004	WT127	2	1cS	0.345	0.029	0.317	472.90	9.22E-03	0.1887	0.0025	0.1862	3.57E-06
7/15/2004	WT127	2	1dS	0.596	0.046	0.550	495.91	1.88E-02	1.0071	0.0141	0.9930	1.91E-05
7/15/2004	WT127	2	1pU	0.341	0.088	0.253	475.41	4.25E-03	0.0016	0.0001	0.0014	2.77E-08
7/15/2004	WT127	2	1aU	0.172	0.109	0.063	475.41	5.31E-03	0.0028	0.0007	0.0021	3.95E-08
7/15/2004	WT127	2	1bU	0.351	0.065	0.285	475.41	1.01E-02	0.0218	0.0019	0.0199	3.81E-07
7/15/2004	WT127	2	1cU	0.713	0.056	0.658	475.41	2.12E-02	0.2995	0.0082	0.2913	5.59E-06
7/15/2004	WT127	2	1dU	2.126	0.073	2.053	505.38	5.77E-02	1.2358	0.0011	1.2346	2.37E-05
7/15/2004	WT127	2	2pS	0.184	0.081	0.103	488.46	1.78E-03	0.0005	0.0001	0.0003	6.00E-09
7/15/2004	WT127	2	2aS	0.113	0.085	0.029	489.98	2.27E-03	0.0081	0.0017	0.0063	1.22E-07
7/15/2004	WT127	2	2bS	0.123	0.075	0.047	489.98	3.09E-03	0.0183	0.0186	0.0000	0.00E+00
7/15/2004	WT127	2	2cS	0.235	0.106	0.128	489.98	5.31E-03	0.0323	0.0059	0.0264	5.06E-07
7/15/2004	WT127	2	2dS	0.202	0.092	0.110	500.52	7.25E-03	0.0573	0.0125	0.0448	8.59E-07
7/15/2004	WT127	2	2pU	0.110	0.075	0.034	488.44	5.91E-04	0.0052	0.0018	0.0034	6.48E-08
7/15/2004	WT127	2	2aU	0.152	0.067	0.085	490.72	2.06E-03	0.0079	0.0038	0.0041	7.84E-08
7/15/2004	WT127	2	2bU	0.121	0.054	0.067	490.72	3.21E-03	0.0055	0.0017	0.0037	7.17E-08
7/15/2004	WT127	2	2cU	0.237	0.050	0.187	490.72	6.45E-03	0.0470	0.0018	0.0452	8.67E-07
7/15/2004	WT127	2	2dU	0.690	0.072	0.617	490.72	1.71E-02	0.3419	0.0046	0.3373	6.47E-06
7/15/2004	WT127	2	3pS	0.252	0.064	0.188	489.73	3.24E-03	0.0004	0.0001	0.0003	5.64E-09
7/15/2004	WT127	2	3aS	0.127	0.060	0.067	493.52	4.41E-03	0.0013	0.0002	0.0011	2.07E-08
7/15/2004	WT127	2	3bS	0.102	0.040	0.062	493.52	5.48E-03	0.0002	0.0001	0.0001	2.38E-09
7/15/2004	WT127	2	3cS	0.189	0.080	0.109	493.52	7.37E-03	0.0582	0.0033	0.0549	1.05E-06
7/15/2004	WT127	2	3dS	0.148	0.044	0.104	506.92	9.24E-03	0.0084	0.0021	0.0063	1.20E-07
7/15/2004	WT127	2	3pU	0.152	0.093	0.058	489.75	1.01E-03	0.0002	0.0002	0.0001	1.53E-09
7/15/2004	WT127	2	3aU	0.231	0.118	0.113	492.04	2.96E-03	0.0004	0.0001	0.0003	5.25E-09
7/15/2004	WT127	2	3bU	0.235	0.059	0.176	492.04	6.01E-03	0.2198	0.0033	0.2166	4.16E-06
7/15/2004	WT127	2	3cU	0.893	0.035	0.858	492.04	2.09E-02	0.3595	0.0021	0.3574	6.86E-06
7/15/2004	WT127	2	3dU	0.792	0.051	0.740	509.20	3.41E-02	0.0667	0.0013	0.0655	1.26E-06

Appendix B (continued)

Table 24 – Results for spike-corrected TSI erosion and ambient concentration, flow, PM-10 cumulative flux, individual PM-10 erosion and ambient net spike mass, and PM-10 net spike mass

Date	Site	Nominal Wind Erodibility Group	Run	spike-corrected TSI Avg erosion conc (mg/m^3)	Avg Tsi Ambient Conc (mg/m3)	concentration difference (mg/m3)	Q (ACFM)	Cumulative PM 10 Flux ton/(acre-hr) = flux in mg / (m2-min) x 1lb/454,000 mg x 1 ton/2000lb x (.305meter / ft)^2 x 43560 ft2/acre x 60 min/hr	Individual PM 10 erosion net spike mass (mg)	Individual PM 10 ambient net spike mass (mg)	Individual PM 10 net spike mass (mg)	PM 10 spike "pulse" (ton/acre)
8/20/2004	WT128	2	1pS	0.119	0.075	0.044	467.12	7.26E-04	0.0004	0.0004	0.0000	8.81E-10
8/20/2004	WT128	2	1aS	0.086	0.061	0.024	467.12	1.13E-03	0.0004	0.0004	0.0000	0.00E+00
8/20/2004	WT128	2	1bS	0.092	0.061	0.031	467.12	1.64E-03	0.0007	0.0005	0.0002	4.70E-09
8/20/2004	WT128	2	1cS	0.230	0.057	0.174	467.12	4.51E-03	0.3015	0.0063	0.2952	5.66E-06
8/20/2004	WT128	2	1dS	0.267	0.062	0.205	499.66	8.11E-03	0.0481	0.0029	0.0452	8.68E-07
8/20/2004	WT128	2	1pU	0.129	0.060	0.069	466.86	1.14E-03	0.0003	0.0001	0.0002	4.05E-09
8/20/2004	WT128	2	1aU	0.099	0.044	0.056	466.86	2.06E-03	0.0155	0.0017	0.0138	2.66E-07
8/20/2004	WT128	2	1bU	0.567	0.047	0.520	466.86	1.07E-02	0.3136	0.0024	0.3112	5.97E-06
8/20/2004	WT128	2	1cU	1.221	0.050	1.171	466.86	3.00E-02	1.1439	0.0038	1.1401	2.19E-05
8/20/2004	WT128	2	1dU	1.955	0.107	1.848	496.38	6.23E-02	0.3210	0.0031	0.3179	6.10E-06
8/20/2004	WT128	2	2pS	0.087	0.032	0.054	468.01	9.00E-04	0.0083	0.0011	0.0072	1.38E-07
8/20/2004	WT128	2	2aS	0.080	0.034	0.046	468.01	1.66E-03	0.0001	0.0001	0.0000	0.00E+00
8/20/2004	WT128	2	2bS	0.274	0.038	0.236	468.01	5.57E-03	0.2859	0.0024	0.2835	5.44E-06
8/20/2004	WT128	2	2cS	0.846	0.038	0.808	468.01	1.90E-02	0.3487	0.0022	0.3465	6.65E-06
8/20/2004	WT128	2	2dS	0.988	0.038	0.951	506.64	3.59E-02	0.1114	0.0013	0.1101	2.11E-06
8/20/2004	WT128	2	2pU	0.128	0.046	0.082	471.03	1.37E-03	0.0184	0.0009	0.0174	3.34E-07
8/20/2004	WT128	2	2aU	0.051	0.043	0.008	471.03	1.51E-03	0.0001	0.0001	0.0000	0.00E+00
8/20/2004	WT128	2	2bU	0.239	0.046	0.193	471.03	4.73E-03	0.1127	0.0023	0.1105	2.12E-06
8/20/2004	WT128	2	2cU	0.713	0.075	0.638	471.03	1.54E-02	0.6122	0.0036	0.6086	1.17E-05
8/20/2004	WT128	2	2dU	2.352	0.065	2.286	504.92	5.60E-02	0.1015	0.0006	0.1009	1.94E-06
8/20/2004	WT128	2	3pS	0.147	0.078	0.069	472.68	1.16E-03	0.0173	0.0110	0.0063	1.21E-07
8/20/2004	WT128	2	3aS	0.101	0.035	0.066	472.68	2.26E-03	0.0087	0.0007	0.0080	1.54E-07
8/20/2004	WT128	2	3bS	0.363	0.040	0.322	472.68	7.65E-03	0.2653	0.0021	0.2632	5.05E-06
8/20/2004	WT128	2	3cS	0.445	0.057	0.388	472.68	1.41E-02	0.4229	0.0023	0.4206	8.07E-06
8/20/2004	WT128	2	3dS	0.638	0.068	0.569	472.68	2.36E-02	0.2248	0.0161	0.2087	4.01E-06
8/20/2004	WT128	2	3pU	0.257	0.091	0.166	474.45	2.79E-03	0.0487	0.0089	0.0399	7.65E-07
8/20/2004	WT128	2	3aU	0.071	0.133	0.000	474.45	2.79E-03	0.0002	0.0003	0.0000	0.00E+00
8/20/2004	WT128	2	3bU	0.386	0.087	0.299	474.45	7.80E-03	0.0957	0.0048	0.0909	1.74E-06
8/20/2004	WT128	2	3cU	1.072	0.054	1.018	474.45	2.49E-02	0.6018	0.0051	0.5966	1.14E-05
8/20/2004	WT128	2	3dU	1.062	0.051	1.010	505.93	4.29E-02	0.0671	0.0016	0.0655	1.26E-06

Appendix B (continued)

Table 24 – Results for spike-corrected TSI erosion and ambient concentration, flow, PM-10 cumulative flux, individual PM-10 erosion and ambient net spike mass, and PM-10 net spike mass

Date	Site	Nominal Wind Erodibility Group	Run	spike-corrected TSI Avg erosion conc (mg/m^3)	Avg Tsi Ambient Conc (mg/m3)	concentration difference (mg/m3)	Q (ACFM)	Cumulative PM 10 Flux ton/(acre-hr) = flux in mg / (m2-min) x 1lb/454,000 mg x 1 ton/2000lb x (.305meter / ft)^2 x 43560 ft2/acre x 60 min/hr	Individual PM 10 erosion net spike mass (mg)	Individual PM 10 ambient net spike mass (mg)	Individual PM 10 net spike mass (mg)	PM 10 spike "pulse" (ton/acre)
8/5/2004	WT130	3	1pS	0.278	0.177	0.101	473.94	1.69E-03	0.0008	0.0004	0.0004	8.58E-09
8/5/2004	WT130	3	1aS	0.127	0.101	0.026	473.94	2.12E-03	0.0161	0.0089	0.0071	1.37E-07
8/5/2004	WT130	3	1bS	0.084	0.060	0.024	473.94	2.52E-03	0.0146	0.0016	0.0130	2.49E-07
8/5/2004	WT130	3	1cS	0.112	0.058	0.054	473.94	3.42E-03	0.0405	0.0014	0.0391	7.50E-07
8/5/2004	WT130	3	1dS	0.294	0.056	0.238	512.26	7.70E-03	0.1623	0.0071	0.1552	2.98E-06
8/5/2004	WT130	3	1pU	0.134	0.083	0.051	474.20	8.62E-04	0.0515	0.0077	0.0437	8.39E-07
8/5/2004	WT130	3	1aU	0.061	0.051	0.010	474.20	1.02E-03	0.0091	0.0083	0.0008	1.51E-08
8/5/2004	WT130	3	1bU	0.273	0.052	0.221	474.20	4.73E-03	0.0732	0.0025	0.0707	1.36E-06
8/5/2004	WT130	3	1cU	1.324	0.049	1.275	474.20	2.61E-02	1.0206	0.0062	1.0143	1.95E-05
8/5/2004	WT130	3	1dU	1.778	0.057	1.720	507.73	5.68E-02	1.6400	0.0146	1.6254	3.12E-05
8/5/2004	WT130	3	2pS	0.312	0.273	0.039	478.05	6.61E-04	0.0347	0.0298	0.0049	9.41E-08
8/5/2004	WT130	3	2aS	0.228	0.205	0.023	478.05	1.05E-03	0.0481	0.0476	0.0005	9.30E-09
8/5/2004	WT130	3	2bS	0.126	0.077	0.049	478.05	1.89E-03	0.0107	0.0043	0.0064	1.23E-07
8/5/2004	WT130	3	2cS	0.138	0.090	0.048	478.05	2.69E-03	0.1289	0.0053	0.1236	2.37E-06
8/5/2004	WT130	3	2dS	0.467	0.111	0.356	506.17	9.04E-03	0.3095	0.0262	0.2833	5.44E-06
8/5/2004	WT130	3	2pU	0.161	0.088	0.073	477.56	1.23E-03	0.0002	0.0001	0.0001	1.08E-09
8/5/2004	WT130	3	2aU	0.091	0.089	0.003	477.56	1.27E-03	0.0095	0.0032	0.0063	1.21E-07
8/5/2004	WT130	3	2bU	0.150	0.056	0.094	477.56	2.85E-03	0.0399	0.0017	0.0382	7.33E-07
8/5/2004	WT130	3	2cU	0.455	0.054	0.401	477.56	9.62E-03	0.2978	0.0058	0.2919	5.60E-06
8/5/2004	WT130	3	2dU	2.056	0.171	1.884	509.24	4.34E-02	0.1432	0.0366	0.1066	2.05E-06
8/5/2004	WT130	3	3pS	0.299	0.180	0.119	479.11	2.01E-03	0.0314	0.0275	0.0039	7.44E-08
8/5/2004	WT130	3	3aS	0.106	0.128	0.000	479.11	2.01E-03	0.0002	0.0010	0.0000	0.00E+00
8/5/2004	WT130	3	3bS	0.660	0.101	0.559	479.11	1.15E-02	0.2083	0.0058	0.2025	3.89E-06
8/5/2004	WT130	3	3cS	0.577	0.084	0.492	479.11	1.98E-02	0.3457	0.0020	0.3437	6.60E-06
8/5/2004	WT130	3	3dS	0.418	0.073	0.345	510.90	2.60E-02	0.0275	0.0008	0.0267	5.13E-07
8/5/2004	WT130	3	3pU	0.264	0.128	0.136	481.38	2.32E-03	0.0006	0.0004	0.0002	4.37E-09
8/5/2004	WT130	3	3aU	0.189	0.135	0.053	481.38	3.22E-03	0.0015	0.0005	0.0011	2.06E-08
8/5/2004	WT130	3	3bU	0.267	0.137	0.130	481.38	5.43E-03	0.2753	0.2269	0.0484	9.28E-07
8/5/2004	WT130	3	3cU	0.744	0.088	0.656	481.38	1.66E-02	0.3909	0.0298	0.3611	6.93E-06
8/5/2004	WT130	3	3dU	2.683	0.297	2.386	497.50	5.84E-02	0.6667	0.0077	0.6590	1.26E-05

Appendix B (continued)

Table 24 – Results for spike-corrected TSI erosion and ambient concentration, flow, PM-10 cumulative flux, individual PM-10 erosion and ambient net spike mass, and PM-10 net spike mass

Date	Site	Nominal Wind Erodibility Group	Run	spike-corrected TSI Avg erosion conc (mg/m^3)	Avg Tsi Ambient Conc (mg/m3)	concentration difference (mg/m3)	Q (ACFM)	Cumulative PM 10 Flux ton/(acre-hr) = flux in mg / (m2-min) x 1lb/454,000 mg x 1 ton/2000lb x (.305meter / ft)^2 x 43560 ft2/acre x 60 min/hr	Individual PM 10 erosion net spike mass (mg)	Individual PM 10 ambient net spike mass (mg)	Individual PM 10 net spike mass (mg)	PM 10 spike "pulse" (ton/acre)
7/20/2004	WT131	3	1pS	0.120	0.159	0.000	472.77	0.00E+00	0.0161	0.0138	0.0023	4.45E-08
7/20/2004	WT131	3	1aS	0.080	0.425	0.000	472.77	0.00E+00	0.0004	0.0003	0.0001	2.61E-09
7/20/2004	WT131	3	1bS	0.088	0.091	0.000	472.77	0.00E+00	0.0043	0.0022	0.0022	4.15E-08
7/20/2004	WT131	3	1cS	0.128	0.048	0.080	472.77	1.34E-03	0.0392	0.0031	0.0361	6.93E-07
7/20/2004	WT131	3	1dS	0.154	0.074	0.080	500.31	2.75E-03	0.0803	0.0112	0.0691	1.33E-06
7/20/2004	WT131	3	1pU	0.160	0.074	0.086	476.53	1.46E-03	0.0028	0.0005	0.0023	4.46E-08
7/20/2004	WT131	3	1aU	0.146	0.073	0.072	476.53	2.67E-03	0.0007	0.0002	0.0005	9.53E-09
7/20/2004	WT131	3	1bU	0.229	0.082	0.147	478.86	5.16E-03	0.0689	0.0025	0.0664	1.27E-06
7/20/2004	WT131	3	1cU	0.420	0.073	0.346	478.86	1.10E-02	0.3171	0.0060	0.3111	5.97E-06
7/20/2004	WT131	3	1dU	0.579	0.085	0.494	507.82	1.98E-02	0.2666	0.0072	0.2594	4.98E-06
7/20/2004	WT131	3	2pS	0.209	0.088	0.121	480.35	2.06E-03	0.0274	0.0031	0.0243	4.66E-07
7/20/2004	WT131	3	2aS	0.132	0.089	0.043	480.35	2.78E-03	0.0012	0.0005	0.0007	1.36E-08
7/20/2004	WT131	3	2bS	0.139	0.107	0.032	480.35	3.32E-03	0.0162	0.0035	0.0127	2.44E-07
7/20/2004	WT131	3	2cS	0.241	0.068	0.173	480.35	6.26E-03	0.0905	0.0031	0.0874	1.68E-06
7/20/2004	WT131	3	2dS	0.387	0.052	0.335	497.88	1.21E-02	0.1726	0.0044	0.1682	3.23E-06
7/20/2004	WT131	3	2pU	0.132	0.038	0.094	481.16	1.59E-03	0.0002	0.0001	0.0002	3.00E-09
7/20/2004	WT131	3	2aU	0.055	0.031	0.025	481.16	2.01E-03	0.0004	0.0003	0.0001	1.34E-09
7/20/2004	WT131	3	2bU	0.101	0.050	0.051	481.16	2.88E-03	0.0158	0.0012	0.0146	2.80E-07
7/20/2004	WT131	3	2cU	0.414	0.028	0.386	481.16	9.43E-03	0.1973	0.0017	0.1956	3.75E-06
7/20/2004	WT131	3	2dU	0.795	0.057	0.738	481.16	2.20E-02	0.4200	0.0023	0.4178	8.02E-06
7/20/2004	WT131	3	3pS	0.160	0.041	0.119	483.69	2.03E-03	0.0211	0.0021	0.0190	3.64E-07
7/20/2004	WT131	3	3aS	0.152	0.033	0.120	482.20	4.06E-03	0.0040	0.0013	0.0027	5.16E-08
7/20/2004	WT131	3	3bS	0.200	0.017	0.183	482.20	7.17E-03	0.0060	0.0003	0.0057	1.09E-07
7/20/2004	WT131	3	3cS	0.219	0.010	0.209	482.20	1.07E-02	0.1954	0.0013	0.1941	3.72E-06
7/20/2004	WT131	3	3dS	0.412	0.043	0.369	495.49	1.72E-02	0.0624	0.0008	0.0616	1.18E-06
7/20/2004	WT131	3	3pU	0.130	0.024	0.105	484.51	1.80E-03	0.0103	0.0006	0.0097	1.86E-07
7/20/2004	WT131	3	3aU	0.074	0.015	0.060	484.51	2.82E-03	0.0004	0.0000	0.0004	7.01E-09
7/20/2004	WT131	3	3bU	0.169	0.030	0.139	484.51	5.19E-03	0.0168	0.0003	0.0165	3.17E-07
7/20/2004	WT131	3	3cU	0.812	0.068	0.744	484.51	1.79E-02	0.2653	0.0006	0.2647	5.08E-06
7/20/2004	WT131	3	3dU	1.715	0.123	1.593	501.46	4.60E-02	0.4660	0.0005	0.4655	8.93E-06

Appendix B (continued)

Table 24 – Results for spike-corrected TSI erosion and ambient concentration, flow, PM-10 cumulative flux, individual PM-10 erosion and ambient net spike mass, and PM-10 net spike mass

Date	Site	Nominal Wind Erodibility Group	Run	spike-corrected TSI Avg erosion conc (mg/m^3)	Avg Tsi Ambient Conc (mg/m3)	concentration difference (mg/m3)	Q (ACFM)	Cumulative PM 10 Flux ton/(acre-hr) = flux in mg / (m2-min) x 1lb/454,000 mg x 1 ton/2000lb x (.305meter / ft)^2 x 43560 ft2/acre x 60 min/hr	Individual PM 10 erosion net spike mass (mg)	Individual PM 10 ambient net spike mass (mg)	Individual PM 10 net spike mass (mg)	PM 10 spike "pulse" (ton/acre)
8/6/2004	WT132	4.1	1pS	0.092	0.087	0.006	466.90	9.17E-05	0.0004	0.0001	0.0002	4.14E-09
8/6/2004	WT132	4.1	1aS	0.053	0.087	0.000	466.90	9.17E-05	0.0152	0.0001	0.0151	2.90E-07
8/6/2004	WT132	4.1	1bS	0.127	0.087	0.040	466.90	7.61E-04	0.0383	0.0001	0.0382	7.33E-07
8/6/2004	WT132	4.1	1cS	0.439	0.087	0.352	466.90	6.58E-03	0.1358	0.0001	0.1356	2.60E-06
8/6/2004	WT132	4.1	1dS	0.222	0.087	0.135	493.68	8.93E-03	0.1054	0.0001	0.1053	2.02E-06
8/6/2004	WT132	4.1	1pU	0.197	0.074	0.123	468.82	2.05E-03	0.0003	0.0001	0.0002	3.10E-09
8/6/2004	WT132	4.1	1aU	0.122	0.074	0.048	468.82	2.84E-03	0.0002	0.0001	0.0001	1.89E-09
8/6/2004	WT132	4.1	1bU	0.082	0.074	0.008	468.82	2.98E-03	0.0056	0.0001	0.0054	1.05E-07
8/6/2004	WT132	4.1	1cU	0.138	0.074	0.064	468.82	4.04E-03	0.0929	0.0001	0.0927	1.78E-06
8/6/2004	WT132	4.1	1dU	0.288	0.074	0.214	468.82	7.58E-03	0.2379	0.0001	0.2378	4.56E-06
8/6/2004	WT132	4.1	2pS	0.148	0.070	0.078	474.26	1.30E-03	0.0174	0.0001	0.0173	3.32E-07
8/6/2004	WT132	4.1	2aS	0.143	0.070	0.073	474.26	2.53E-03	0.0081	0.0001	0.0080	1.54E-07
8/6/2004	WT132	4.1	2bS	0.078	0.070	0.008	474.26	2.66E-03	0.0091	0.0001	0.0090	1.72E-07
8/6/2004	WT132	4.1	2cS	0.176	0.070	0.106	474.26	4.43E-03	0.0655	0.0001	0.0654	1.26E-06
8/6/2004	WT132	4.1	2dS	0.392	0.070	0.322	502.68	1.01E-02	0.1215	0.0001	0.1214	2.33E-06
8/6/2004	WT132	4.1	2pU	0.250	0.067	0.183	474.43	3.07E-03	0.0005	0.0001	0.0004	7.01E-09
8/6/2004	WT132	4.1	2aU	0.064	0.067	0.000	474.43	3.07E-03	0.0103	0.0001	0.0103	1.97E-07
8/6/2004	WT132	4.1	2bU	0.219	0.067	0.152	474.43	5.63E-03	0.0280	0.0001	0.0279	5.36E-07
8/6/2004	WT132	4.1	2cU	0.351	0.067	0.284	474.43	1.04E-02	0.1722	0.0001	0.1722	3.30E-06
8/6/2004	WT132	4.1	2dU	2.385	0.067	2.318	501.64	5.13E-02	0.1553	0.0001	0.1552	2.98E-06
8/6/2004	WT132	4.1	3pS	0.187	0.049	0.138	477.05	2.33E-03	0.0518	0.0001	0.0517	9.93E-07
8/6/2004	WT132	4.1	3aS	0.172	0.049	0.123	477.05	4.40E-03	0.0011	0.0001	0.0010	1.96E-08
8/6/2004	WT132	4.1	3bS	0.113	0.049	0.064	477.05	5.48E-03	0.0002	0.0001	0.0001	1.96E-09
8/6/2004	WT132	4.1	3cS	0.221	0.049	0.172	477.05	8.38E-03	0.0221	0.0001	0.0220	4.22E-07
8/6/2004	WT132	4.1	3dS	0.476	0.049	0.427	505.20	1.60E-02	0.1490	0.0001	0.1489	2.86E-06
8/6/2004	WT132	4.1	3pU	0.109	0.043	0.066	478.57	1.12E-03	0.0123	0.0001	0.0122	2.34E-07
8/6/2004	WT132	4.1	3aU	0.098	0.043	0.055	478.57	2.06E-03	0.0634	0.0001	0.0634	1.22E-06
8/6/2004	WT132	4.1	3bU	0.257	0.043	0.214	478.57	5.67E-03	0.0181	0.0001	0.0180	3.45E-07
8/6/2004	WT132	4.1	3cU	0.263	0.043	0.220	478.57	9.39E-03	0.1360	0.0001	0.1359	2.61E-06
8/6/2004	WT132	4.1	3dU	0.453	0.043	0.410	505.31	1.67E-02	0.2730	0.0001	0.2729	5.24E-06

Appendix B (continued)

Table 24 – Results for spike-corrected TSI erosion and ambient concentration, flow, PM-10 cumulative flux, individual PM-10 erosion and ambient net spike mass, and PM-10 net spike mass

Date	Site	Nominal Wind Erodibility Group	Run	spike-corrected TSI Avg erosion conc (mg/m^3)	Avg Tsi Ambient Conc (mg/m3)	concentration difference (mg/m3)	Q (ACFM)	Cumulative PM 10 Flux ton/(acre-hr) = flux in mg / (m2-min) x 1lb/454,000 mg x 1 ton/2000lb x (.305meter / ft)^2 x 43560 ft2/acre x 60 min/hr	Individual PM 10 erosion net spike mass (mg)	Individual PM 10 ambient net spike mass (mg)	Individual PM 10 net spike mass (mg)	PM 10 spike "pulse" (ton/acre)
7/26/2004	WT133	7	1pS	0.360	0.195	0.165	472.10	2.75E-03	0.0005	0.0003	0.0002	3.59E-09
7/26/2004	WT133	7	1aS	0.318	0.193	0.125	472.10	4.85E-03	0.0175	0.0078	0.0097	1.86E-07
7/26/2004	WT133	7	1bS	0.516	0.252	0.263	472.10	9.24E-03	0.1978	0.0128	0.1850	3.55E-06
7/26/2004	WT133	7	1cS	0.622	0.186	0.436	472.10	1.65E-02	0.2134	0.0133	0.2002	3.84E-06
7/26/2004	WT133	7	1dS	0.725	0.147	0.578	514.88	2.70E-02	0.0198	0.0020	0.0179	3.43E-07
7/26/2004	WT133	7	1pU	0.340	0.112	0.228	473.76	3.81E-03	0.0011	0.0002	0.0009	1.68E-08
7/26/2004	WT133	7	1aU	0.196	0.095	0.101	473.76	5.51E-03	0.0090	0.0023	0.0068	1.30E-07
7/26/2004	WT133	7	1bU	1.071	0.057	1.014	473.76	2.25E-02	0.3471	0.0084	0.3387	6.50E-06
7/26/2004	WT133	7	1cU	1.782	0.039	1.743	473.76	5.17E-02	1.3723	0.0152	1.3571	2.60E-05
7/26/2004	WT133	7	1dU	1.587	0.064	1.523	503.28	7.87E-02	0.2709	0.0047	0.2662	5.11E-06
7/26/2004	WT133	7	2pS	0.268	0.047	0.222	475.47	3.72E-03	0.0007	0.0001	0.0007	1.28E-08
7/26/2004	WT133	7	2aS	0.075	0.038	0.037	475.47	4.34E-03	0.0003	0.0001	0.0002	4.27E-09
7/26/2004	WT133	7	2bS	0.070	0.045	0.024	475.47	4.75E-03	0.0150	0.0032	0.0117	2.25E-07
7/26/2004	WT133	7	2cS	0.346	0.056	0.291	475.47	9.63E-03	0.1982	0.0034	0.1949	3.74E-06
7/26/2004	WT133	7	2dS	0.292	0.041	0.251	499.24	1.41E-02	0.0004	0.0001	0.0003	5.55E-09
7/26/2004	WT133	7	2pU	0.205	0.065	0.141	477.02	2.37E-03	0.0933	0.0043	0.0890	1.71E-06
7/26/2004	WT133	7	2aU	0.086	0.076	0.009	477.02	2.53E-03	0.0004	0.0002	0.0002	3.10E-09
7/26/2004	WT133	7	2bU	0.323	0.079	0.244	477.02	6.64E-03	0.1536	0.0067	0.1469	2.82E-06
7/26/2004	WT133	7	2cU	0.702	0.091	0.611	477.02	1.69E-02	0.4644	0.0035	0.4609	8.84E-06
7/26/2004	WT133	7	2dU	0.536	0.081	0.455	498.74	2.49E-02	0.1191	0.0100	0.1091	2.09E-06
7/26/2004	WT133	7	3pS	0.297	0.070	0.227	480.31	3.85E-03	0.0921	0.0069	0.0852	1.64E-06
7/26/2004	WT133	7	3aS	0.092	0.065	0.027	478.82	4.30E-03	0.0093	0.0053	0.0040	7.65E-08
7/26/2004	WT133	7	3bS	0.533	0.094	0.438	478.82	1.17E-02	0.0091	0.0022	0.0069	1.32E-07
7/26/2004	WT133	7	3cS	0.570	0.080	0.489	478.82	2.00E-02	0.9248	0.0077	0.9170	1.76E-05
7/26/2004	WT133	7	3dS	0.360	0.119	0.241	502.76	2.43E-02	0.0173	0.0036	0.0137	2.63E-07
7/26/2004	WT133	7	3pU	0.618	0.092	0.527	481.12	8.95E-03	0.0020	0.0002	0.0018	3.51E-08
7/26/2004	WT133	7	3aU	0.119	0.078	0.041	481.12	9.65E-03	0.0003	0.0004	0.0000	0.00E+00
7/26/2004	WT133	7	3bU	0.245	0.102	0.142	481.12	1.21E-02	0.0073	0.0016	0.0057	1.09E-07
7/26/2004	WT133	7	3cU	0.320	0.056	0.263	481.12	1.65E-02	0.0469	0.0010	0.0460	8.82E-07
7/26/2004	WT133	7	3dU	2.319	0.114	2.204	501.54	5.55E-02	0.5074	0.0125	0.4949	9.50E-06

Appendix B (continued)

Table 24 – Results for spike-corrected TSI erosion and ambient concentration, flow, PM-10 cumulative flux, individual PM-10 erosion and ambient net spike mass, and PM-10 net spike mass

Date	Site	Nominal Wind Erodibility Group	Run	spike-corrected TSI Avg erosion conc (mg/m^3)	Avg Tsi Ambient Conc (mg/m3)	concentration difference (mg/m3)	Q (ACFM)	Cumulative PM 10 Flux ton/(acre-hr) = flux in mg / (m2-min) x 1lb/454,000 mg x 1 ton/2000lb x (.305meter / ft)^2 x 43560 ft2/acre x 60 min/hr	Individual PM 10 erosion net spike mass (mg)	Individual PM 10 ambient net spike mass (mg)	Individual PM 10 net spike mass (mg)	PM 10 spike "pulse" (ton/acre)
7/12/2004	WT134	4	1pS	0.311	0.172	0.139	476.43	2.33E-03	0.0431	0.0096	0.0334	6.41E-07
7/12/2004	WT134	4	1aS	0.210	0.153	0.057	476.43	3.29E-03	0.0224	0.0179	0.0045	8.69E-08
7/12/2004	WT134	4	1bS	0.355	0.175	0.180	476.43	6.32E-03	0.0419	0.0076	0.0343	6.59E-07
7/12/2004	WT134	4	1cS	1.424	0.192	1.232	476.43	2.71E-02	0.1792	0.0099	0.1692	3.25E-06
7/12/2004	WT134	4	1dS	1.364	0.168	1.196	476.43	4.72E-02	0.8806	0.0342	0.8463	1.62E-05
7/12/2004	WT134	4	1pU	0.205	0.164	0.040	480.53	6.86E-04	0.0466	0.0042	0.0424	8.14E-07
7/12/2004	WT134	4	1aU	0.147	0.162	0.000	480.53	6.86E-04	0.0041	0.0073	0.0000	0.00E+00
7/12/2004	WT134	4	1bU	0.595	0.153	0.442	480.53	8.18E-03	0.0303	0.0008	0.0295	5.66E-07
7/12/2004	WT134	4	1cU	0.868	0.111	0.757	480.53	2.10E-02	0.6992	0.0093	0.6899	1.32E-05
7/12/2004	WT134	4	1dU	2.618	0.196	2.423	480.53	6.21E-02	1.4813	0.0100	1.4713	2.82E-05
7/12/2004	WT134	4	2pS	0.260	0.269	0.000	478.38	0.00E+00	0.1605	0.0123	0.1482	2.84E-06
7/12/2004	WT134	4	2aS	0.249	0.305	0.000	478.38	0.00E+00	0.0009	0.0010	0.0000	0.00E+00
7/12/2004	WT134	4	2bS	0.298	0.149	0.149	478.38	2.52E-03	0.0516	0.0081	0.0435	8.34E-07
7/12/2004	WT134	4	2cS	0.342	0.146	0.195	478.38	5.82E-03	0.0449	0.0022	0.0427	8.19E-07
7/12/2004	WT134	4	2dS	1.362	0.144	1.218	478.38	2.64E-02	0.3126	0.0053	0.3073	5.90E-06
7/12/2004	WT134	4	2pU	0.205	0.110	0.095	482.96	1.62E-03	0.0030	0.0002	0.0028	5.42E-08
7/12/2004	WT134	4	2aU	0.111	0.093	0.018	482.96	1.92E-03	0.0164	0.0121	0.0042	8.12E-08
7/12/2004	WT134	4	2bU	0.251	0.053	0.198	482.96	5.30E-03	0.0069	0.0009	0.0060	1.15E-07
7/12/2004	WT134	4	2cU	0.291	0.038	0.253	482.96	9.61E-03	0.1399	0.0010	0.1389	2.67E-06
7/12/2004	WT134	4	2dU	1.632	0.065	1.567	482.96	3.63E-02	0.4805	0.0018	0.4787	9.19E-06
7/12/2004	WT134	4	3pS	0.482	0.131	0.351	474.94	5.90E-03	0.0878	0.0033	0.0844	1.62E-06
7/12/2004	WT134	4	3aS	0.204	0.164	0.040	474.94	6.56E-03	0.0118	0.0116	0.0001	2.38E-09
7/12/2004	WT134	4	3bS	0.293	0.087	0.206	474.94	1.00E-02	0.0286	0.0010	0.0275	5.28E-07
7/12/2004	WT134	4	3cS	0.409	0.124	0.286	474.94	1.48E-02	0.0073	0.0003	0.0070	1.34E-07
7/12/2004	WT134	4	3dS	2.670	0.065	2.605	474.94	5.85E-02	0.4923	0.0023	0.4901	9.40E-06
7/12/2004	WT134	4	3pU	0.432	0.412	0.020	488.81	3.47E-04	0.0544	0.0070	0.0474	9.10E-07
7/12/2004	WT134	4	3aU	0.214	0.585	0.000	488.81	3.47E-04	0.0128	0.0158	0.0000	0.00E+00
7/12/2004	WT134	4	3bU	0.202	0.439	0.000	488.81	3.47E-04	0.0097	0.0024	0.0073	1.40E-07
7/12/2004	WT134	4	3cU	0.711	0.268	0.443	488.81	7.98E-03	0.0112	0.0078	0.0034	6.47E-08
7/12/2004	WT134	4	3dU	1.719	0.236	1.484	488.81	3.36E-02	1.1444	0.0120	1.1324	2.17E-05

Appendix B (continued)

Table 24 – Results for spike-corrected TSI erosion and ambient concentration, flow, PM-10 cumulative flux, individual PM-10 erosion and ambient net spike mass, and PM-10 net spike mass

Date	Site	Nominal Wind Erodibility Group	Run	spike-corrected TSI Avg erosion conc (mg/m^3)	Avg Tsi Ambient Conc (mg/m3)	concentration difference (mg/m3)	Q (ACFM)	Cumulative PM 10 Flux ton/(acre-hr) = flux in mg / (m2-min) x 1lb/454,000 mg x 1 ton/2000lb x (.305meter / ft)^2 x 43560 ft2/acre x 60 min/hr	Individual PM 10 erosion net spike mass (mg)	Individual PM 10 ambient net spike mass (mg)	Individual PM 10 net spike mass (mg)	PM 10 spike "pulse" (ton/acre)
7/23/2004	WT135	6	1pS	0.202	0.041	0.160	470.23	2.67E-03	0.0009	0.0001	0.0008	1.50E-08
7/23/2004	WT135	6	1aS	0.379	0.131	0.247	470.23	6.79E-03	0.0029	0.0000	0.0029	5.52E-08
7/23/2004	WT135	6	1bS	0.083	0.009	0.075	470.23	8.03E-03	0.0361	0.0004	0.0357	6.85E-07
7/23/2004	WT135	6	1cS	0.135	0.015	0.121	470.23	1.00E-02	0.1235	0.0005	0.1230	2.36E-06
7/23/2004	WT135	6	1dS	0.306	0.010	0.296	500.64	1.53E-02	0.2745	0.0005	0.2740	5.26E-06
7/23/2004	WT135	6	1pU	0.084	0.018	0.066	467.60	1.09E-03	0.0078	0.0005	0.0073	1.41E-07
7/23/2004	WT135	6	1aU	0.093	0.023	0.070	471.28	2.27E-03	0.0104	0.0018	0.0085	1.63E-07
7/23/2004	WT135	6	1bU	0.199	0.027	0.172	471.28	5.14E-03	0.1522	0.0010	0.1512	2.90E-06
7/23/2004	WT135	6	1cU	0.826	0.043	0.783	471.28	1.82E-02	0.6928	0.0037	0.6891	1.32E-05
7/23/2004	WT135	6	1dU	0.968	0.062	0.906	492.74	3.39E-02	0.1053	0.0019	0.1034	1.98E-06
7/23/2004	WT135	6	2pS	0.167	0.082	0.085	472.93	1.42E-03	0.0023	0.0003	0.0020	3.82E-08
7/23/2004	WT135	6	2aS	0.079	0.092	0.000	473.66	1.42E-03	0.0005	0.0005	0.0000	2.61E-10
7/23/2004	WT135	6	2bS	0.233	0.077	0.156	473.66	4.02E-03	0.0390	0.0019	0.0371	7.11E-07
7/23/2004	WT135	6	2cS	0.772	0.154	0.618	473.66	1.44E-02	0.3493	0.0078	0.3415	6.55E-06
7/23/2004	WT135	6	2dS	2.227	0.141	2.086	498.12	5.10E-02	1.0759	0.0183	1.0576	2.03E-05
7/23/2004	WT135	6	2pU	0.158	0.119	0.038	475.52	6.44E-04	0.0002	0.0002	0.0000	0.00E+00
7/23/2004	WT135	6	2aU	0.129	0.109	0.020	475.52	9.77E-04	0.0125	0.0049	0.0077	1.47E-07
7/23/2004	WT135	6	2bU	0.315	0.042	0.273	475.52	5.57E-03	0.0403	0.0005	0.0398	7.64E-07
7/23/2004	WT135	6	2cU	0.839	0.042	0.797	475.52	1.90E-02	0.6518	0.0028	0.6490	1.25E-05
7/23/2004	WT135	6	2dU	3.219	0.172	3.047	498.02	7.24E-02	2.0179	0.0294	1.9885	3.82E-05
7/23/2004	WT135	6	3pS	0.340	0.160	0.180	480.87	3.05E-03	0.0006	0.0003	0.0003	5.94E-09
7/23/2004	WT135	6	3aS	0.495	0.154	0.341	480.13	8.83E-03	0.0012	0.0002	0.0011	2.07E-08
7/23/2004	WT135	6	3bS	1.159	0.114	1.045	480.13	2.65E-02	0.3867	0.0051	0.3815	7.32E-06
7/23/2004	WT135	6	3cS	0.795	0.095	0.700	480.13	3.84E-02	1.0652	0.0221	1.0431	2.00E-05
7/23/2004	WT135	6	3dS	0.864	0.156	0.708	501.99	5.09E-02	0.0583	0.0023	0.0560	1.08E-06
7/23/2004	WT135	6	3pU	0.344	0.093	0.252	483.25	4.29E-03	0.0071	0.0011	0.0060	1.16E-07
7/23/2004	WT135	6	3aU	0.227	0.061	0.166	483.25	7.13E-03	0.0003	0.0000	0.0003	4.86E-09
7/23/2004	WT135	6	3bU	2.041	0.232	1.810	483.25	3.80E-02	1.2701	0.0287	1.2414	2.38E-05
7/23/2004	WT135	6	3cU	2.391	0.087	2.304	483.25	7.73E-02	1.1279	0.0101	1.1177	2.14E-05
7/23/2004	WT135	6	3dU	2.986	0.094	2.892	501.66	1.28E-01	0.8678	0.0210	0.8467	1.62E-05

Appendix B (continued)

Table 24 – Results for spike-corrected TSI erosion and ambient concentration, flow, PM-10 cumulative flux, individual PM-10 erosion and ambient net spike mass, and PM-10 net spike mass

Date	Site	Nominal Wind Erodibility Group	Run	spike-corrected TSI Avg erosion conc (mg/m^3)	Avg Tsi Ambient Conc (mg/m3)	concentration difference (mg/m3)	Q (ACFM)	Cumulative PM 10 Flux ton/(acre-hr) = flux in mg / (m2-min) x 1lb/454,000 mg x 1 ton/2000lb x (.305meter / ft)^2 x 43560 ft2/acre x 60 min/hr	Individual PM 10 erosion net spike mass (mg)	Individual PM 10 ambient net spike mass (mg)	Individual PM 10 net spike mass (mg)	PM 10 spike "pulse" (ton/acre)
7/29/2004	WT136	0	1pS	0.141	0.161	0.000	467.09	0.00E+00	0.0096	0.0167	0.0000	0.00E+00
7/29/2004	WT136	0	1aS	0.146	0.129	0.017	467.09	2.80E-04	0.0020	0.0008	0.0012	2.31E-08
7/29/2004	WT136	0	1bS	0.143	0.135	0.008	467.09	4.09E-04	0.0216	0.0043	0.0173	3.33E-07
7/29/2004	WT136	0	1cS	0.177	0.122	0.055	467.09	1.32E-03	0.0483	0.0073	0.0409	7.86E-07
7/29/2004	WT136	0	1dS	0.221	0.126	0.095	516.82	3.04E-03	0.0380	0.0049	0.0331	6.36E-07
7/29/2004	WT136	0	1pU	0.143	0.145	0.000	475.49	0.00E+00	0.0005	0.0004	0.0002	3.59E-09
7/29/2004	WT136	0	1aU	0.184	0.094	0.090	475.49	1.51E-03	0.0007	0.0005	0.0003	4.89E-09
7/29/2004	WT136	0	1bU	0.421	0.083	0.338	475.49	7.19E-03	0.1946	0.0039	0.1908	3.66E-06
7/29/2004	WT136	0	1cU	0.807	0.082	0.726	475.49	1.94E-02	0.8963	0.0134	0.8829	1.69E-05
7/29/2004	WT136	0	1dU	0.630	0.091	0.540	519.38	2.92E-02	0.1430	0.0047	0.1383	2.65E-06
7/29/2004	WT136	0	2pS	0.092	0.028	0.064	478.60	1.08E-03	0.0002	0.0000	0.0000	7.18E-10
7/29/2004	WT136	0	2aS	0.066	0.025	0.041	478.60	1.77E-03	0.0063	0.0006	0.0057	1.10E-07
7/29/2004	WT136	0	2bS	0.076	0.038	0.038	478.60	2.41E-03	0.0274	0.0014	0.0260	4.99E-07
7/29/2004	WT136	0	2cS	0.271	0.023	0.247	478.60	6.58E-03	0.1498	0.0018	0.1479	2.84E-06
7/29/2004	WT136	0	2dS	0.273	0.031	0.242	520.73	1.10E-02	0.0265	0.0014	0.0251	4.82E-07
7/29/2004	WT136	0	2pU	0.066	0.031	0.035	480.66	5.92E-04	0.0052	0.0002	0.0050	9.50E-08
7/29/2004	WT136	0	2aU	0.040	0.023	0.017	480.66	8.74E-04	0.0031	0.0005	0.0025	4.88E-08
7/29/2004	WT136	0	2bU	0.339	0.023	0.316	480.66	6.24E-03	0.1398	0.0014	0.1384	2.66E-06
7/29/2004	WT136	0	2cU	0.408	0.025	0.383	480.66	1.27E-02	0.2015	0.0016	0.1998	3.83E-06
7/29/2004	WT136	0	2dU	0.615	0.036	0.579	519.52	2.33E-02	0.0969	0.0009	0.0960	1.84E-06
7/29/2004	WT136	0	3pS	0.064	0.031	0.033	481.39	5.64E-04	0.0002	0.0000	0.0002	3.59E-09
7/29/2004	WT136	0	3aS	0.078	0.027	0.051	481.39	1.44E-03	0.0002	0.0001	0.0001	1.37E-09
7/29/2004	WT136	0	3bS	0.074	0.028	0.046	481.39	2.21E-03	0.0036	0.0003	0.0033	6.40E-08
7/29/2004	WT136	0	3cS	0.092	0.027	0.065	481.39	3.32E-03	0.0341	0.0015	0.0327	6.27E-07
7/29/2004	WT136	0	3dS	0.260	0.037	0.223	509.01	7.31E-03	0.0435	0.0018	0.0417	8.00E-07
7/29/2004	WT136	0	3pU	0.115	0.058	0.057	482.95	9.69E-04	0.0002	0.0001	0.0002	3.16E-09
7/29/2004	WT136	0	3aU	0.076	0.027	0.048	482.95	1.79E-03	0.0004	0.0002	0.0003	4.96E-09
7/29/2004	WT136	0	3bU	0.141	0.038	0.104	482.95	3.56E-03	0.0141	0.0014	0.0127	2.43E-07
7/29/2004	WT136	0	3cU	0.421	0.030	0.391	482.95	1.02E-02	0.1289	0.0027	0.1263	2.42E-06
7/29/2004	WT136	0	3dU	0.397	0.034	0.363	514.99	1.68E-02	0.3834	0.0033	0.3801	7.29E-06

Appendix B (continued)

Table 24 – Results for spike-corrected TSI erosion and ambient concentration, flow, PM-10 cumulative flux, individual PM-10 erosion and ambient net spike mass, and PM-10 net spike mass

Date	Site	Nominal Wind Erodibility Group	Run	spike-corrected TSI Avg erosion conc (mg/m^3)	Avg Tsi Ambient Conc (mg/m3)	concentration difference (mg/m3)	Q (ACFM)	Cumulative PM 10 Flux ton/(acre-hr) = flux in mg / (m2-min) x 1lb/454,000 mg x 1 ton/2000lb x (.305meter / ft)^2 x 43560 ft2/acre x 60 min/hr	Individual PM 10 erosion net spike mass (mg)	Individual PM 10 ambient net spike mass (mg)	Individual PM 10 net spike mass (mg)	PM 10 spike "pulse" (ton/acre)
8/10/2004	WT137	4	1pS	0.146	0.071	0.076	539.05	1.43E-03	0.0384	0.0098	0.0286	5.48E-07
8/10/2004	WT137	4	1aS	0.101	0.079	0.022	539.05	1.85E-03	0.0007	0.0003	0.0004	8.48E-09
8/10/2004	WT137	4	1bS	0.101	0.056	0.046	539.05	2.71E-03	0.0051	0.0026	0.0025	4.72E-08
8/10/2004	WT137	4	1cS	0.125	0.069	0.056	539.05	3.76E-03	0.0236	0.0020	0.0216	4.14E-07
8/10/2004	WT137	4	1dS	0.187	0.068	0.120	539.05	6.02E-03	0.0520	0.0019	0.0501	9.62E-07
8/10/2004	WT137	4	1pU	0.101	0.088	0.013	558.25	2.53E-04	0.0002	0.0001	0.0001	2.09E-09
8/10/2004	WT137	4	1aU	0.071	0.059	0.012	558.25	4.82E-04	0.0042	0.0012	0.0029	5.65E-08
8/10/2004	WT137	4	1bU	0.088	0.050	0.038	558.25	1.23E-03	0.0302	0.0027	0.0275	5.27E-07
8/10/2004	WT137	4	1cU	0.170	0.049	0.120	558.25	3.58E-03	0.1190	0.0043	0.1147	2.20E-06
8/10/2004	WT137	4	1dU	0.386	0.053	0.333	593.76	1.05E-02	0.1910	0.0031	0.1879	3.61E-06
8/10/2004	WT137	4	2pS	0.079	0.056	0.023	559.99	4.55E-04	0.0070	0.0025	0.0046	8.75E-08
8/10/2004	WT137	4	2aS	0.053	0.039	0.014	559.99	7.22E-04	0.0002	0.0001	0.0000	9.46E-10
8/10/2004	WT137	4	2bS	0.057	0.034	0.023	559.99	1.18E-03	0.0164	0.0024	0.0140	2.69E-07
8/10/2004	WT137	4	2cS	0.081	0.029	0.051	559.99	2.18E-03	0.0409	0.0021	0.0388	7.45E-07
8/10/2004	WT137	4	2dS	0.076	0.026	0.050	596.21	3.22E-03	0.0432	0.0029	0.0403	7.73E-07
8/10/2004	WT137	4	2pU	0.106	0.055	0.051	560.95	9.90E-04	0.0001	0.0001	0.0001	1.50E-09
8/10/2004	WT137	4	2aU	0.046	0.027	0.019	560.95	1.37E-03	0.0001	0.0001	0.0001	1.01E-09
8/10/2004	WT137	4	2bU	0.318	0.026	0.292	560.95	7.09E-03	0.0391	0.0006	0.0385	7.39E-07
8/10/2004	WT137	4	2cU	0.529	0.027	0.502	560.95	1.69E-02	0.2030	0.0008	0.2022	3.88E-06
8/10/2004	WT137	4	2dU	0.700	0.026	0.675	594.05	3.09E-02	0.2806	0.0066	0.2740	5.26E-06
8/10/2004	WT137	4	3pS	0.063	0.043	0.020	567.25	4.00E-04	0.0044	0.0003	0.0041	7.88E-08
8/10/2004	WT137	4	3aS	0.053	0.048	0.005	567.25	4.95E-04	0.0041	0.0008	0.0034	6.47E-08
8/10/2004	WT137	4	3bS	0.057	0.035	0.022	567.25	9.36E-04	0.0031	0.0025	0.0006	1.14E-08
8/10/2004	WT137	4	3cS	0.053	0.033	0.020	567.25	1.32E-03	0.0024	0.0006	0.0017	3.31E-08
8/10/2004	WT137	4	3dS	0.143	0.031	0.112	597.93	3.65E-03	0.0326	0.0020	0.0306	5.87E-07
8/10/2004	WT137	4	3pU	0.122	0.038	0.084	566.41	1.66E-03	0.0004	0.0001	0.0004	6.72E-09
8/10/2004	WT137	4	3aU	0.100	0.035	0.065	566.41	2.94E-03	0.0046	0.0007	0.0038	7.37E-08
8/10/2004	WT137	4	3bU	0.325	0.036	0.289	566.41	8.65E-03	0.1937	0.0022	0.1915	3.67E-06
8/10/2004	WT137	4	3cU	0.751	0.033	0.717	566.41	2.28E-02	0.4010	0.0016	0.3994	7.66E-06
8/10/2004	WT137	4	3dU	0.765	0.091	0.674	607.16	3.71E-02	0.3346	0.0024	0.3321	6.37E-06

Appendix B (continued)

Table 24 – Results for spike-corrected TSI erosion and ambient concentration, flow, PM-10 cumulative flux, individual PM-10 erosion and ambient net spike mass, and PM-10 net spike mass

Date	Site	Nominal Wind Erodibility Group	Run	spike-corrected TSI Avg erosion conc (mg/m^3)	Avg Tsi Ambient Conc (mg/m3)	concentration difference (mg/m3)	Q (ACFM)	Cumulative PM 10 Flux ton/(acre-hr) = flux in mg / (m2-min) x 1lb/454,000 mg x 1 ton/2000lb x (.305meter / ft)^2 x 43560 ft2/acre x 60 min/hr	Individual PM 10 erosion net spike mass (mg)	Individual PM 10 ambient net spike mass (mg)	Individual PM 10 net spike mass (mg)	PM 10 spike "pulse" (ton/acre)
8/11/2004	WT138	3	1pS	0.110	0.087	0.023	552.65	4.53E-04	0.0059	0.0012	0.0047	9.02E-08
8/11/2004	WT138	3	1aS	0.067	0.048	0.020	552.65	8.36E-04	0.0003	0.0002	0.0001	2.58E-09
8/11/2004	WT138	3	1bS	0.063	0.047	0.016	552.65	1.15E-03	0.0026	0.0016	0.0010	1.91E-08
8/11/2004	WT138	3	1cS	0.085	0.047	0.038	552.65	1.87E-03	0.0183	0.0049	0.0134	2.57E-07
8/11/2004	WT138	3	1dS	0.093	0.093	0.001	581.10	1.89E-03	0.0125	0.0046	0.0079	1.51E-07
8/11/2004	WT138	3	1pU	0.081	0.040	0.041	564.58	8.06E-04	0.0006	0.0001	0.0005	9.04E-09
8/11/2004	WT138	3	1aU	0.055	0.042	0.013	564.58	1.05E-03	0.0001	0.0001	0.0000	9.79E-11
8/11/2004	WT138	3	1bU	0.122	0.042	0.080	564.58	2.63E-03	0.0669	0.0028	0.0641	1.23E-06
8/11/2004	WT138	3	1cU	0.425	0.054	0.372	564.58	9.96E-03	0.2119	0.0019	0.2099	4.03E-06
8/11/2004	WT138	3	1dU	0.511	0.066	0.445	596.96	1.92E-02	0.5892	0.0087	0.5805	1.11E-05
8/11/2004	WT138	3	2pS	0.105	0.044	0.061	565.49	1.21E-03	0.0003	0.0001	0.0003	4.93E-09
8/11/2004	WT138	3	2aS	0.063	0.069	0.000	565.49	1.21E-03	0.0041	0.0039	0.0002	4.50E-09
8/11/2004	WT138	3	2bS	0.055	0.047	0.008	565.49	1.37E-03	0.0049	0.0014	0.0036	6.84E-08
8/11/2004	WT138	3	2cS	0.065	0.044	0.021	565.49	1.79E-03	0.0544	0.0024	0.0520	9.98E-07
8/11/2004	WT138	3	2dS	0.184	0.070	0.114	582.79	4.11E-03	0.1036	0.0062	0.0973	1.87E-06
8/11/2004	WT138	3	2pU	0.107	0.047	0.060	567.33	1.19E-03	0.0008	0.0001	0.0007	1.28E-08
8/11/2004	WT138	3	2aU	0.051	0.035	0.016	567.33	1.50E-03	0.0003	0.0001	0.0002	3.69E-09
8/11/2004	WT138	3	2bU	0.071	0.032	0.039	567.33	2.27E-03	0.0153	0.0011	0.0143	2.74E-07
8/11/2004	WT138	3	2cU	0.356	0.038	0.317	567.33	8.55E-03	0.1905	0.0032	0.1873	3.59E-06
8/11/2004	WT138	3	2dU	0.999	0.045	0.954	587.24	2.81E-02	0.9515	0.0123	0.9392	1.80E-05
8/11/2004	WT138	3	3pS	0.178	0.232	0.000	568.28	0.00E+00	0.0024	0.0045	0.0000	0.00E+00
8/11/2004	WT138	3	3aS	0.093	0.094	0.000	568.28	0.00E+00	0.0003	0.0004	0.0000	0.00E+00
8/11/2004	WT138	3	3bS	0.115	0.080	0.035	568.28	6.88E-04	0.0134	0.0034	0.0100	1.92E-07
8/11/2004	WT138	3	3cS	0.151	0.060	0.090	568.28	2.48E-03	0.0707	0.0033	0.0675	1.29E-06
8/11/2004	WT138	3	3dS	0.206	0.074	0.133	568.28	5.11E-03	0.0869	0.0023	0.0846	1.62E-06
8/11/2004	WT138	3	3pU	0.112	0.114	0.000	572.83	0.00E+00	0.0046	0.0041	0.0005	8.64E-09
8/11/2004	WT138	3	3aU	0.078	0.064	0.014	572.83	2.79E-04	0.0044	0.0015	0.0029	5.53E-08
8/11/2004	WT138	3	3bU	0.140	0.060	0.080	572.83	1.88E-03	0.0412	0.0039	0.0373	7.16E-07
8/11/2004	WT138	3	3cU	0.383	0.056	0.327	572.83	8.42E-03	0.1915	0.0026	0.1888	3.62E-06
8/11/2004	WT138	3	3dU	0.719	0.062	0.656	601.47	2.21E-02	0.1639	0.0097	0.1542	2.96E-06

Appendix B (continued)

Table 24 – Results for spike-corrected TSI erosion and ambient concentration, flow, PM-10 cumulative flux, individual PM-10 erosion and ambient net spike mass, and PM-10 net spike mass

Date	Site	Nominal Wind Erodibility Group	Run	spike-corrected TSI Avg erosion conc (mg/m^3)	Avg Tsi Ambient Conc (mg/m3)	concentration difference (mg/m3)	Q (ACFM)	Cumulative PM 10 Flux ton/(acre-hr) = flux in mg / (m2-min) x 1lb/454,000 mg x 1 ton/2000lb x (.305meter / ft)^2 x 43560 ft2/acre x 60 min/hr	Individual PM 10 erosion net spike mass (mg)	Individual PM 10 ambient net spike mass (mg)	Individual PM 10 net spike mass (mg)	PM 10 spike "pulse" (ton/acre)
8/12/2004	WT139	4	1pS	0.168	0.133	0.034	556.42	6.68E-04	0.0241	0.0051	0.0190	3.65E-07
8/12/2004	WT139	4	1aS	0.141	0.093	0.048	556.42	1.61E-03	0.0018	0.0001	0.0017	3.23E-08
8/12/2004	WT139	4	1bS	0.160	0.080	0.080	556.42	3.16E-03	0.0356	0.0074	0.0282	5.41E-07
8/12/2004	WT139	4	1cS	0.251	0.063	0.188	556.42	6.81E-03	0.2088	0.0111	0.1978	3.80E-06
8/12/2004	WT139	4	1dS	1.327	0.086	1.242	565.05	3.13E-02	0.5509	0.0118	0.5391	1.03E-05
8/12/2004	WT139	4	1pU	0.230	0.070	0.160	559.99	3.13E-03	0.0008	0.0002	0.0006	1.18E-08
8/12/2004	WT139	4	1aU	0.107	0.050	0.057	559.99	4.25E-03	0.0007	0.0003	0.0005	8.64E-09
8/12/2004	WT139	4	1bU	0.631	0.056	0.575	559.99	1.55E-02	0.2563	0.0074	0.2489	4.78E-06
8/12/2004	WT139	4	1cU	1.636	0.073	1.563	559.99	4.61E-02	0.8479	0.0086	0.8392	1.61E-05
8/12/2004	WT139	4	1dU	1.640	0.079	1.561	586.33	7.79E-02	0.0705	0.0030	0.0675	1.30E-06
8/12/2004	WT139	4	2pS	0.217	0.067	0.151	564.65	2.97E-03	0.0018	0.0004	0.0014	2.67E-08
8/12/2004	WT139	4	2aS	0.144	0.051	0.093	564.65	4.80E-03	0.0005	0.0001	0.0003	6.59E-09
8/12/2004	WT139	4	2bS	0.330	0.052	0.278	564.65	1.03E-02	0.0412	0.0018	0.0394	7.57E-07
8/12/2004	WT139	4	2cS	0.579	0.055	0.524	564.65	2.06E-02	0.2120	0.0026	0.2094	4.02E-06
8/12/2004	WT139	4	2dS	0.440	0.053	0.387	564.65	2.82E-02	0.4556	0.0117	0.4439	8.52E-06
8/12/2004	WT139	4	2pU	0.141	0.070	0.071	569.13	1.41E-03	0.0756	0.0045	0.0711	1.36E-06
8/12/2004	WT139	4	2aU	0.098	0.049	0.049	569.13	2.39E-03	0.0006	0.0001	0.0005	9.04E-09
8/12/2004	WT139	4	2bU	0.295	0.057	0.238	569.13	7.10E-03	0.0387	0.0023	0.0364	6.98E-07
8/12/2004	WT139	4	2cU	0.838	0.056	0.782	569.13	2.26E-02	0.1646	0.0042	0.1604	3.08E-06
8/12/2004	WT139	4	2dU	3.602	0.097	3.505	569.13	9.22E-02	1.1574	0.0083	1.1491	2.21E-05
8/12/2004	WT139	4	3pS	0.157	0.051	0.106	563.93	2.09E-03	0.0077	0.0593	0.0000	0.00E+00
8/12/2004	WT139	4	3aS	0.377	0.153	0.224	563.93	6.50E-03	0.0018	0.0007	0.0011	2.18E-08
8/12/2004	WT139	4	3bS	0.337	0.114	0.223	563.93	1.09E-02	0.0945	0.0083	0.0862	1.65E-06
8/12/2004	WT139	4	3cS	0.957	0.128	0.829	563.93	2.72E-02	0.3140	0.0109	0.3031	5.82E-06
8/12/2004	WT139	4	3dS	0.648	0.121	0.527	585.54	3.80E-02	0.1056	0.0030	0.1026	1.97E-06
8/12/2004	WT139	4	3pU	0.187	0.130	0.057	568.25	1.13E-03	0.0009	0.0002	0.0008	1.47E-08
8/12/2004	WT139	4	3aU	0.175	0.110	0.065	568.25	2.42E-03	0.0122	0.0012	0.0110	2.12E-07
8/12/2004	WT139	4	3bU	0.577	0.097	0.480	568.25	1.19E-02	0.0600	0.0017	0.0583	1.12E-06
8/12/2004	WT139	4	3cU	1.825	0.106	1.720	568.25	4.60E-02	1.0325	0.0206	1.0118	1.94E-05
8/12/2004	WT139	4	3dU	3.346	0.140	3.207	568.25	1.10E-01	2.7531	0.0197	2.7334	5.25E-05

Appendix B (continued)

Table 24 – Results for spike-corrected TSI erosion and ambient concentration, flow, PM-10 cumulative flux, individual PM-10 erosion and ambient net spike mass, and PM-10 net spike mass

Date	Site	Nominal Wind Erodibility Group	Run	spike-corrected TSI Avg erosion conc (mg/m^3)	Avg Tsi Ambient Conc (mg/m3)	concentration difference (mg/m3)	Q (ACFM)	Cumulative PM 10 Flux ton/(acre-hr) = flux in mg / (m2-min) x 1lb/454,000 mg x 1 ton/2000lb x (.305meter / ft)^2 x 43560 ft2/acre x 60 min/hr	Individual PM 10 erosion net spike mass (mg)	Individual PM 10 ambient net spike mass (mg)	Individual PM 10 net spike mass (mg)	PM 10 spike "pulse" (ton/acre)
8/13/2004	WT140	4	1pS	0.085	0.011	0.074	473.93	1.24E-03	0.0040	0.0009	0.0031	5.90E-08
8/13/2004	WT140	4	1aS	0.051	0.016	0.035	473.93	1.82E-03	0.0001	0.0000	0.0000	7.50E-10
8/13/2004	WT140	4	1bS	0.098	0.017	0.081	473.93	3.18E-03	0.1051	0.0010	0.1041	2.00E-06
8/13/2004	WT140	4	1cS	0.220	0.016	0.204	473.93	6.60E-03	0.1297	0.0007	0.1290	2.48E-06
8/13/2004	WT140	4	1dS	0.458	0.029	0.430	512.24	1.43E-02	0.0101	0.0004	0.0097	1.86E-07
8/13/2004	WT140	4	1pU	0.105	0.051	0.054	480.19	9.15E-04	0.0003	0.0000	0.0003	5.25E-09
8/13/2004	WT140	4	1aU	0.137	0.030	0.107	480.19	2.73E-03	0.0003	0.0001	0.0001	2.77E-09
8/13/2004	WT140	4	1bU	0.646	0.040	0.606	480.19	1.30E-02	0.5241	0.0053	0.5189	9.96E-06
8/13/2004	WT140	4	1cU	0.998	0.050	0.947	480.19	2.91E-02	0.4037	0.0033	0.4004	7.68E-06
8/13/2004	WT140	4	1dU	1.343	0.045	1.298	520.84	5.28E-02	0.2882	0.0044	0.2837	5.44E-06
8/13/2004	WT140	4	2pS	0.213	0.142	0.071	483.65	1.21E-03	0.0003	0.0003	0.0000	0.00E+00
8/13/2004	WT140	4	2aS	0.059	0.066	0.000	483.65	1.21E-03	0.0006	0.0102	0.0000	0.00E+00
8/13/2004	WT140	4	2bS	0.082	0.039	0.043	483.65	1.94E-03	0.0292	0.0042	0.0250	4.80E-07
8/13/2004	WT140	4	2cS	0.177	0.045	0.132	483.65	4.19E-03	0.1128	0.0035	0.1093	2.10E-06
8/13/2004	WT140	4	2dS	0.229	0.063	0.166	531.45	7.28E-03	0.0944	0.0149	0.0795	1.53E-06
8/13/2004	WT140	4	2pU	0.079	0.052	0.027	483.65	4.60E-04	0.0002	0.0001	0.0001	2.48E-09
8/13/2004	WT140	4	2aU	0.128	0.046	0.082	483.65	1.86E-03	0.0015	0.0002	0.0014	2.60E-08
8/13/2004	WT140	4	2bU	0.338	0.035	0.303	483.65	7.03E-03	0.1460	0.0008	0.1452	2.79E-06
8/13/2004	WT140	4	2cU	1.709	0.066	1.643	483.65	3.51E-02	0.7743	0.0021	0.7722	1.48E-05
8/13/2004	WT140	4	2dU	1.368	0.065	1.303	531.45	5.93E-02	0.2377	0.0042	0.2334	4.48E-06
8/13/2004	WT140	4	3pS	0.108	0.142	0.000	487.43	0.00E+00	0.0005	0.0003	0.0002	4.37E-09
8/13/2004	WT140	4	3aS	0.069	0.069	0.000	487.43	0.00E+00	0.0004	0.0004	0.0000	0.00E+00
8/13/2004	WT140	4	3bS	0.087	0.049	0.038	487.43	6.54E-04	0.0475	0.0030	0.0445	8.54E-07
8/13/2004	WT140	4	3cS	0.303	0.055	0.247	487.43	4.91E-03	0.1226	0.0022	0.1203	2.31E-06
8/13/2004	WT140	4	3dS	0.249	0.061	0.187	525.43	8.36E-03	0.0454	0.0027	0.0427	8.19E-07
8/13/2004	WT140	4	3pU	0.073	0.050	0.023	487.43	3.92E-04	0.0008	0.0001	0.0007	1.42E-08
8/13/2004	WT140	4	3aU	0.085	0.074	0.011	494.54	5.82E-04	0.0005	0.0006	0.0000	0.00E+00
8/13/2004	WT140	4	3bU	1.266	0.071	1.195	494.54	2.14E-02	0.3469	0.0051	0.3418	6.56E-06
8/13/2004	WT140	4	3cU	2.458	0.060	2.398	494.54	6.32E-02	0.7431	0.0022	0.7409	1.42E-05
8/13/2004	WT140	4	3dU	2.665	0.059	2.606	537.24	1.12E-01	0.3682	0.0018	0.3664	7.03E-06

Appendix B (continued)

Table 24 – Results for spike-corrected TSI erosion and ambient concentration, flow, PM-10 cumulative flux, individual PM-10 erosion and ambient net spike mass, and PM-10 net spike mass

Date	Site	Nominal Wind Erodibility Group	Run	spike-corrected TSI Avg erosion conc (mg/m^3)	Avg Tsi Ambient Conc (mg/m3)	concentration difference (mg/m3)	Q (ACFM)	Cumulative PM 10 Flux ton/(acre-hr) = flux in mg / (m2-min) x 1lb/454,000 mg x 1 ton/2000lb x (.305meter / ft)^2 x 43560 ft2/acre x 60 min/hr	Individual PM 10 erosion net spike mass (mg)	Individual PM 10 ambient net spike mass (mg)	Individual PM 10 net spike mass (mg)	PM 10 spike "pulse" (ton/acre)
8/18/2004	WT141	3	1pS	0.163	0.070	0.094	472.05	1.56E-03	0.0266	0.0012	0.0254	4.88E-07
8/18/2004	WT141	3	1aS	0.093	0.039	0.055	472.05	2.48E-03	0.0003	0.0002	0.0002	3.07E-09
8/18/2004	WT141	3	1bS	0.089	0.051	0.038	472.05	3.12E-03	0.0137	0.0024	0.0113	2.18E-07
8/18/2004	WT141	3	1cS	0.126	0.066	0.060	472.19	4.12E-03	0.0453	0.0036	0.0416	7.99E-07
8/18/2004	WT141	3	1dS	0.187	0.044	0.143	506.01	6.66E-03	0.1027	0.0055	0.0972	1.87E-06
8/18/2004	WT141	3	1pU	0.068	0.039	0.030	479.40	5.02E-04	0.0002	0.0000	0.0002	3.91E-09
8/18/2004	WT141	3	1aU	0.060	0.039	0.021	479.40	8.49E-04	0.0003	0.0001	0.0002	3.46E-09
8/18/2004	WT141	3	1bU	0.068	0.034	0.034	479.40	1.43E-03	0.0203	0.0010	0.0193	3.70E-07
8/18/2004	WT141	3	1cU	0.185	0.027	0.158	479.40	4.10E-03	0.0798	0.0016	0.0782	1.50E-06
8/18/2004	WT141	3	1dU	0.469	0.038	0.431	506.11	1.18E-02	0.2049	0.0038	0.2011	3.86E-06
8/18/2004	WT141	3	2pS	0.056	0.030	0.026	477.91	4.39E-04	0.0004	0.0001	0.0003	6.52E-09
8/18/2004	WT141	3	2aS	0.028	0.025	0.003	477.91	4.93E-04	0.0004	0.0001	0.0003	6.17E-09
8/18/2004	WT141	3	2bS	0.397	0.026	0.371	477.91	6.75E-03	0.1996	0.0016	0.1980	3.80E-06
8/18/2004	WT141	3	2cS	0.310	0.049	0.262	477.91	1.12E-02	0.0501	0.0009	0.0492	9.45E-07
8/18/2004	WT141	3	2dS	0.344	0.087	0.257	516.55	1.58E-02	0.0118	0.0009	0.0108	2.08E-07
8/18/2004	WT141	3	2pU	0.103	0.026	0.077	478.92	1.31E-03	0.0078	0.0004	0.0074	1.42E-07
8/18/2004	WT141	3	2aU	0.156	0.027	0.130	478.92	3.50E-03	0.0002	0.0001	0.0001	2.48E-09
8/18/2004	WT141	3	2bU	0.428	0.025	0.404	478.92	1.03E-02	0.3437	0.0019	0.3418	6.56E-06
8/18/2004	WT141	3	2cU	1.128	0.027	1.101	478.92	2.89E-02	0.4315	0.0011	0.4304	8.26E-06
8/18/2004	WT141	3	2dU	1.040	0.038	1.002	506.39	4.68E-02	0.1981	0.0011	0.1970	3.78E-06
8/18/2004	WT141	3	3pS	0.221	0.044	0.177	482.87	3.01E-03	0.0004	0.0000	0.0004	7.47E-09
8/18/2004	WT141	3	3aS	0.062	0.049	0.013	482.87	3.23E-03	0.0003	0.0002	0.0001	2.48E-09
8/18/2004	WT141	3	3bS	0.114	0.031	0.083	482.87	4.65E-03	0.0577	0.0017	0.0560	1.07E-06
8/18/2004	WT141	3	3cS	0.106	0.031	0.075	482.87	5.93E-03	0.2287	0.0044	0.2242	4.30E-06
8/18/2004	WT141	3	3dS	0.123	0.036	0.087	510.57	7.50E-03	0.0121	0.0015	0.0106	2.03E-07
8/18/2004	WT141	3	3pU	0.127	0.031	0.096	487.62	1.65E-03	0.0066	0.0010	0.0056	1.07E-07
8/18/2004	WT141	3	3aU	0.114	0.055	0.059	487.62	2.67E-03	0.0005	0.0001	0.0003	6.43E-09
8/18/2004	WT141	3	3bU	0.182	0.036	0.147	488.37	5.19E-03	0.0479	0.0024	0.0455	8.73E-07
8/18/2004	WT141	3	3cU	0.224	0.029	0.195	488.37	8.55E-03	0.0952	0.0018	0.0933	1.79E-06
8/18/2004	WT141	3	3dU	0.324	0.028	0.296	522.70	1.40E-02	0.2971	0.0045	0.2926	5.62E-06

Appendix B (continued)

Table 24 – Results for spike-corrected TSI erosion and ambient concentration, flow, PM-10 cumulative flux, individual PM-10 erosion and ambient net spike mass, and PM-10 net spike mass

Date	Site	Nominal Wind Erodibility Group	Run	spike-corrected TSI Avg erosion conc (mg/m^3)	Avg Tsi Ambient Conc (mg/m3)	concentration difference (mg/m3)	Q (ACFM)	Cumulative PM 10 Flux ton/(acre-hr) = flux in mg / (m2-min) x 1lb/454,000 mg x 1 ton/2000lb x (.305meter / ft)^2 x 43560 ft2/acre x 60 min/hr	Individual PM 10 erosion net spike mass (mg)	Individual PM 10 ambient net spike mass (mg)	Individual PM 10 net spike mass (mg)	PM 10 spike "pulse" (ton/acre)
7/16/2004	WT142	4	1pS	0.135	0.039	0.096	482.03	1.63E-03	0.0014	0.0001	0.0013	2.51E-08
7/16/2004	WT142	4	1aS	0.055	0.031	0.024	482.03	2.05E-03	0.0002	0.0000	0.0002	2.97E-09
7/16/2004	WT142	4	1bS	0.099	0.054	0.044	482.03	2.80E-03	0.0281	0.0026	0.0255	4.90E-07
7/16/2004	WT142	4	1cS	0.355	0.030	0.325	482.03	8.33E-03	0.2168	0.0056	0.2112	4.05E-06
7/16/2004	WT142	4	1dS	0.402	0.042	0.360	507.47	1.47E-02	0.1862	0.0070	0.1792	3.44E-06
7/16/2004	WT142	4	1pU	0.056	0.027	0.029	482.86	4.89E-04	0.0001	0.0000	0.0000	1.63E-10
7/16/2004	WT142	4	1aU	0.036	0.020	0.016	482.86	7.68E-04	0.0002	0.0001	0.0001	1.76E-09
7/16/2004	WT142	4	1bU	0.165	0.018	0.147	482.86	3.28E-03	0.0880	0.0018	0.0862	1.65E-06
7/16/2004	WT142	4	1cU	0.627	0.032	0.595	482.86	1.34E-02	0.4146	0.0014	0.4132	7.93E-06
7/16/2004	WT142	4	1dU	0.454	0.020	0.435	509.13	2.12E-02	0.0272	0.0005	0.0267	5.12E-07
7/16/2004	WT142	4	2pS	0.050	0.014	0.036	486.76	6.20E-04	0.0365	0.0018	0.0347	6.66E-07
7/16/2004	WT142	4	2aS	0.029	0.010	0.019	486.76	9.48E-04	0.0002	0.0000	0.0002	3.26E-09
7/16/2004	WT142	4	2bS	0.066	0.012	0.054	486.76	1.88E-03	0.0001	0.0000	0.0000	8.48E-10
7/16/2004	WT142	4	2cS	0.146	0.011	0.135	486.76	4.20E-03	0.0004	0.0000	0.0004	7.31E-09
7/16/2004	WT142	4	2dS	0.092	0.015	0.077	507.42	5.57E-03	0.0002	0.0000	0.0002	3.91E-09
7/16/2004	WT142	4	2pU	0.046	0.014	0.032	484.21	5.54E-04	0.0007	0.0000	0.0007	1.32E-08
7/16/2004	WT142	4	2aU	0.027	0.013	0.014	486.50	7.94E-04	0.0002	0.0000	0.0002	3.10E-09
7/16/2004	WT142	4	2bU	0.038	0.019	0.018	486.50	1.11E-03	0.0070	0.0010	0.0060	1.15E-07
7/16/2004	WT142	4	2cU	0.165	0.010	0.156	486.50	3.78E-03	0.1376	0.0003	0.1373	2.63E-06
7/16/2004	WT142	4	2dU	0.503	0.007	0.496	512.42	1.27E-02	0.0153	0.0002	0.0151	2.91E-07
7/16/2004	WT142	4	3pS	0.084	0.032	0.052	489.64	8.93E-04	0.0160	0.0014	0.0146	2.80E-07
7/16/2004	WT142	4	3aS	0.042	0.044	0.000	489.64	8.93E-04	0.0036	0.0013	0.0024	4.58E-08
7/16/2004	WT142	4	3bS	0.110	0.021	0.090	489.64	2.44E-03	0.0165	0.0011	0.0154	2.96E-07
7/16/2004	WT142	4	3cS	0.154	0.039	0.115	489.64	4.42E-03	0.0526	0.0016	0.0511	9.80E-07
7/16/2004	WT142	4	3dS	0.099	0.053	0.046	489.64	5.21E-03	0.0000	0.0000	0.0000	0.00E+00
7/16/2004	WT142	4	3pU	0.108	0.043	0.066	496.77	1.15E-03	0.0004	0.0001	0.0003	5.51E-09
7/16/2004	WT142	4	3aU	0.077	0.038	0.040	496.77	1.84E-03	0.0002	0.0000	0.0002	4.44E-09
7/16/2004	WT142	4	3bU	0.217	0.024	0.193	496.77	5.22E-03	0.0822	0.0020	0.0802	1.54E-06
7/16/2004	WT142	4	3cU	0.351	0.009	0.342	496.77	1.12E-02	0.0527	0.0008	0.0519	9.97E-07
7/16/2004	WT142	4	3dU	0.453	0.023	0.430	517.85	1.90E-02	0.0184	0.0002	0.0181	3.48E-07

Appendix B (continued)

Table 24 – Results for spike-corrected TSI erosion and ambient concentration, flow, PM-10 cumulative flux, individual PM-10 erosion and ambient net spike mass, and PM-10 net spike mass

Date	Site	Nominal Wind Erodibility Group	Run	spike-corrected TSI Avg erosion conc (mg/m^3)	Avg Tsi Ambient Conc (mg/m3)	concentration difference (mg/m3)	Q (ACFM)	Cumulative PM 10 Flux ton/(acre-hr) = flux in mg / (m2-min) x 1lb/454,000 mg x 1 ton/2000lb x (.305meter / ft)^2 x 43560 ft2/acre x 60 min/hr	Individual PM 10 erosion net spike mass (mg)	Individual PM 10 ambient net spike mass (mg)	Individual PM 10 net spike mass (mg)	PM 10 spike "pulse" (ton/acre)
8/16/2004	WT143	4	1pS	0.163	0.017	0.146	467.88	2.41E-03	0.0187	0.0003	0.0184	3.53E-07
8/16/2004	WT143	4	1aS	0.035	0.017	0.018	467.88	2.71E-03	0.0000	0.0001	0.0000	0.00E+00
8/16/2004	WT143	4	1bS	0.141	0.015	0.125	467.88	4.78E-03	0.0187	0.0003	0.0184	3.54E-07
8/16/2004	WT143	4	1cS	0.152	0.018	0.133	467.88	6.99E-03	0.1401	0.0025	0.1376	2.64E-06
8/16/2004	WT143	4	1dS	0.125	0.021	0.104	511.61	8.85E-03	0.0113	0.0003	0.0110	2.12E-07
8/16/2004	WT143	4	1pU	0.053	0.014	0.039	469.25	6.51E-04	0.0026	0.0002	0.0024	4.58E-08
8/16/2004	WT143	4	1aU	0.033	0.015	0.017	469.25	9.41E-04	0.0000	0.0000	0.0000	0.00E+00
8/16/2004	WT143	4	1bU	0.075	0.015	0.060	469.25	1.94E-03	0.0728	0.0009	0.0719	1.38E-06
8/16/2004	WT143	4	1cU	0.522	0.015	0.506	469.25	1.03E-02	0.2958	0.0012	0.2946	5.65E-06
8/16/2004	WT143	4	1dU	0.756	0.019	0.737	517.24	2.37E-02	0.1677	0.0010	0.1667	3.20E-06
8/16/2004	WT143	4	2pS	0.165	0.094	0.071	472.28	1.19E-03	0.0130	0.0010	0.0120	2.30E-07
8/16/2004	WT143	4	2aS	0.078	0.035	0.043	472.28	1.90E-03	0.0001	0.0001	0.0000	0.00E+00
8/16/2004	WT143	4	2bS	0.118	0.058	0.060	472.28	2.90E-03	0.1007	0.0071	0.0936	1.80E-06
8/16/2004	WT143	4	2cS	0.259	0.057	0.202	472.28	6.27E-03	0.1856	0.0028	0.1828	3.51E-06
8/16/2004	WT143	4	2dS	0.308	0.046	0.262	505.47	1.09E-02	0.2092	0.0041	0.2051	3.94E-06
8/16/2004	WT143	4	2pU	0.063	0.069	0.000	473.37	0.00E+00	0.0002	0.0002	0.0001	1.27E-09
8/16/2004	WT143	4	2aU	0.049	0.044	0.005	473.37	8.22E-05	0.0002	0.0001	0.0001	2.12E-09
8/16/2004	WT143	4	2bU	0.523	0.059	0.464	473.37	7.85E-03	0.1968	0.0017	0.1951	3.74E-06
8/16/2004	WT143	4	2cU	0.676	0.046	0.630	473.37	1.84E-02	0.5049	0.0045	0.5004	9.60E-06
8/16/2004	WT143	4	2dU	0.920	0.047	0.873	507.43	3.40E-02	0.2906	0.0090	0.2816	5.40E-06
8/16/2004	WT143	4	3pS	0.174	0.130	0.044	488.19	7.55E-04	0.0091	0.0133	0.0000	0.00E+00
8/16/2004	WT143	4	3aS	0.050	0.098	0.000	488.19	7.55E-04	0.0003	0.0006	0.0000	0.00E+00
8/16/2004	WT143	4	3bS	0.140	0.063	0.077	488.19	2.08E-03	0.0164	0.0010	0.0154	2.96E-07
8/16/2004	WT143	4	3cS	0.224	0.056	0.168	488.19	4.98E-03	0.1956	0.0117	0.1840	3.53E-06
8/16/2004	WT143	4	3dS	0.371	0.056	0.315	523.31	1.08E-02	0.0317	0.0040	0.0277	5.32E-07
8/16/2004	WT143	4	3pU	0.110	0.289	0.000	478.34	0.00E+00	0.0003	0.0001	0.0002	4.44E-09
8/16/2004	WT143	4	3aU	0.062	0.044	0.018	478.34	2.98E-04	0.0001	0.0001	0.0000	8.81E-10
8/16/2004	WT143	4	3bU	0.169	0.053	0.116	478.34	2.26E-03	0.2314	0.0085	0.2229	4.28E-06
8/16/2004	WT143	4	3cU	0.914	0.046	0.868	478.34	1.69E-02	0.4336	0.0065	0.4271	8.20E-06
8/16/2004	WT143	4	3dU	0.959	0.062	0.897	499.48	3.27E-02	0.8431	0.0095	0.8336	1.60E-05

Appendix B (continued)

Table 24 – Results for spike-corrected TSI erosion and ambient concentration, flow, PM-10 cumulative flux, individual PM-10 erosion and ambient net spike mass, and PM-10 net spike mass

Date	Site	Nominal Wind Erodibility Group	Run	spike-corrected TSI Avg erosion conc (mg/m^3)	Avg Tsi Ambient Conc (mg/m3)	concentration difference (mg/m3)	Q (ACFM)	Cumulative PM 10 Flux ton/(acre-hr) = flux in mg / (m2-min) x 1lb/454,000 mg x 1 ton/2000lb x (.305meter / ft)^2 x 43560 ft2/acre x 60 min/hr	Individual PM 10 erosion net spike mass (mg)	Individual PM 10 ambient net spike mass (mg)	Individual PM 10 net spike mass (mg)	PM 10 spike "pulse" (ton/acre)
8/9/2004	WT144	4	1pS	0.307	0.062	0.245	477.04	4.13E-03	0.0292	0.0014	0.0277	5.32E-07
8/9/2004	WT144	4	1aS	0.274	0.055	0.219	477.04	7.82E-03	0.0004	0.0001	0.0003	5.94E-09
8/9/2004	WT144	4	1bS	0.254	0.049	0.205	477.04	1.13E-02	0.3858	0.0055	0.3804	7.30E-06
8/9/2004	WT144	4	1cS	0.358	0.031	0.327	477.04	1.68E-02	0.0247	0.0004	0.0242	4.65E-07
8/9/2004	WT144	4	1dS	0.502	0.082	0.420	505.19	2.43E-02	0.0109	0.0009	0.0100	1.92E-07
8/9/2004	WT144	4	1pU	0.155	0.141	0.014	480.92	2.43E-04	0.0006	0.0005	0.0001	2.61E-09
8/9/2004	WT144	4	1aU	0.130	0.056	0.074	480.92	1.50E-03	0.0002	0.0001	0.0001	1.08E-09
8/9/2004	WT144	4	1bU	0.399	0.046	0.353	480.92	7.49E-03	0.1166	0.0012	0.1153	2.21E-06
8/9/2004	WT144	4	1cU	0.757	0.064	0.693	480.92	1.93E-02	0.8049	0.0038	0.8011	1.54E-05
8/9/2004	WT144	4	1dU	1.408	0.081	1.326	508.51	4.30E-02	0.1707	0.0023	0.1684	3.23E-06
8/9/2004	WT144	4	2pS	0.249	0.260	0.000	483.79	0.00E+00	0.0049	0.0045	0.0003	6.20E-09
8/9/2004	WT144	4	2aS	0.120	0.173	0.000	483.79	0.00E+00	0.0010	0.0007	0.0003	5.58E-09
8/9/2004	WT144	4	2bS	0.238	0.063	0.175	483.79	3.00E-03	0.1583	0.0073	0.1510	2.90E-06
8/9/2004	WT144	4	2cS	0.148	0.034	0.114	483.79	4.94E-03	0.0361	0.0013	0.0347	6.67E-07
8/9/2004	WT144	4	2dS	0.203	0.087	0.116	483.79	6.92E-03	0.0070	0.0006	0.0064	1.22E-07
8/9/2004	WT144	4	2pU	0.160	0.149	0.010	483.32	1.79E-04	0.0042	0.0058	0.0000	0.00E+00
8/9/2004	WT144	4	2aU	0.098	0.076	0.022	483.32	5.55E-04	0.0086	0.0049	0.0037	7.05E-08
8/9/2004	WT144	4	2bU	0.442	0.063	0.379	483.32	7.02E-03	0.2458	0.0059	0.2399	4.60E-06
8/9/2004	WT144	4	2cU	0.877	0.085	0.792	483.32	2.05E-02	0.7824	0.0102	0.7722	1.48E-05
8/9/2004	WT144	4	2dU	1.364	0.063	1.301	512.64	4.40E-02	0.2318	0.0041	0.2277	4.37E-06
8/9/2004	WT144	4	3pS	0.226	0.148	0.077	488.74	1.33E-03	0.0084	0.0233	0.0000	0.00E+00
8/9/2004	WT144	4	3aS	0.173	0.084	0.089	488.74	2.86E-03	0.0135	0.0009	0.0126	2.42E-07
8/9/2004	WT144	4	3bS	0.144	0.091	0.053	488.74	3.77E-03	0.0986	0.0038	0.0948	1.82E-06
8/9/2004	WT144	4	3cS	0.325	0.053	0.272	488.74	8.46E-03	0.1517	0.0022	0.1495	2.87E-06
8/9/2004	WT144	4	3dS	0.312	0.049	0.263	488.74	1.30E-02	0.0372	0.0038	0.0333	6.39E-07
8/9/2004	WT144	4	3pU	0.211	0.067	0.144	487.79	2.48E-03	0.0006	0.0000	0.0006	1.15E-08
8/9/2004	WT144	4	3aU	0.138	0.076	0.062	487.79	3.54E-03	0.0008	0.0001	0.0007	1.30E-08
8/9/2004	WT144	4	3bU	0.278	0.078	0.200	487.79	6.98E-03	0.0062	0.0003	0.0059	1.14E-07
8/9/2004	WT144	4	3cU	2.002	0.036	1.966	487.79	4.08E-02	1.9126	0.0168	1.8958	3.64E-05
8/9/2004	WT144	4	3dU	5.106	0.081	5.024	519.34	1.32E-01	0.0000	0.0001	0.0000	0.00E+00

Appendix B (continued)

Table 24 – Results for spike-corrected TSI erosion and ambient concentration, flow, PM-10 cumulative flux, individual PM-10 erosion and ambient net spike mass, and PM-10 net spike mass

Date	Site	Nominal Wind Erodibility Group	Run	spike-corrected TSI Avg erosion conc (mg/m^3)	Avg Tsi Ambient Conc (mg/m3)	concentration difference (mg/m3)	Q (ACFM)	Cumulative PM 10 Flux ton/(acre-hr) = flux in mg / (m2-min) x 1lb/454,000 mg x 1 ton/2000lb x (.305meter / ft)^2 x 43560 ft2/acre x 60 min/hr	Individual PM 10 erosion net spike mass (mg)	Individual PM 10 ambient net spike mass (mg)	Individual PM 10 net spike mass (mg)	PM 10 spike "pulse" (ton/acre)
8/17/2004	WT146	6	1pS	0.105	0.014	0.091	472.82	1.52E-03	0.0342	0.0123	0.0218	4.19E-07
8/17/2004	WT146	6	1aS	0.053	0.018	0.034	472.82	2.10E-03	0.0002	0.0000	0.0001	2.28E-09
8/17/2004	WT146	6	1bS	0.060	0.015	0.045	472.82	2.86E-03	0.0151	0.0003	0.0148	2.84E-07
8/17/2004	WT146	6	1cS	0.295	0.016	0.279	472.82	7.52E-03	0.1180	0.0009	0.1171	2.25E-06
8/17/2004	WT146	6	1dS	0.280	0.017	0.264	506.84	1.22E-02	0.3608	0.0011	0.3598	6.90E-06
8/17/2004	WT146	6	1pU	0.070	0.018	0.052	475.26	8.80E-04	0.0003	0.0001	0.0002	4.11E-09
8/17/2004	WT146	6	1aU	0.092	0.018	0.074	475.26	2.11E-03	0.0002	0.0009	0.0000	0.00E+00
8/17/2004	WT146	6	1bU	0.701	0.019	0.682	475.26	1.36E-02	0.5599	0.0015	0.5584	1.07E-05
8/17/2004	WT146	6	1cU	1.489	0.017	1.472	475.26	3.83E-02	0.4203	0.0010	0.4193	8.05E-06
8/17/2004	WT146	6	1dU	2.036	0.017	2.020	503.31	7.41E-02	0.2777	0.0006	0.2771	5.32E-06
8/17/2004	WT146	6	2pS	0.269	0.029	0.240	479.18	4.06E-03	0.0005	0.0000	0.0005	1.00E-08
8/17/2004	WT146	6	2aS	0.148	0.022	0.126	479.18	6.19E-03	0.0001	0.0001	0.0000	0.00E+00
8/17/2004	WT146	6	2bS	0.288	0.020	0.268	479.18	1.07E-02	0.1679	0.0007	0.1671	3.21E-06
8/17/2004	WT146	6	2cS	0.824	0.049	0.775	479.18	2.39E-02	0.3106	0.0007	0.3098	5.95E-06
8/17/2004	WT146	6	2dS	0.609	0.037	0.572	503.14	3.40E-02	0.0414	0.0034	0.0381	7.31E-07
8/17/2004	WT146	6	2pU	0.130	0.130	0.000	482.63	0.00E+00	0.0003	0.0000	0.0002	4.63E-09
8/17/2004	WT146	6	2aU	0.184	0.071	0.114	482.63	1.93E-03	0.0005	0.0001	0.0005	9.07E-09
8/17/2004	WT146	6	2bU	0.250	0.068	0.182	482.63	5.03E-03	0.0455	0.0027	0.0427	8.20E-07
8/17/2004	WT146	6	2cU	1.111	0.104	1.007	482.63	2.22E-02	0.6965	0.0033	0.6932	1.33E-05
8/17/2004	WT146	6	2dU	3.916	0.151	3.765	503.17	8.89E-02	0.9870	0.0101	0.9769	1.87E-05
8/17/2004	WT146	6	3pS	0.367	0.105	0.263	484.21	4.49E-03	0.0725	0.0190	0.0535	1.03E-06
8/17/2004	WT146	6	3aS	0.155	0.070	0.084	484.21	5.93E-03	0.0012	0.0004	0.0008	1.56E-08
8/17/2004	WT146	6	3bS	0.496	0.072	0.424	484.21	1.32E-02	0.2030	0.0023	0.2007	3.85E-06
8/17/2004	WT146	6	3cS	0.968	0.065	0.902	484.21	2.86E-02	0.6267	0.0113	0.6154	1.18E-05
8/17/2004	WT146	6	3dS	1.463	0.075	1.388	506.99	5.33E-02	0.8711	0.0140	0.8571	1.64E-05
8/17/2004	WT146	6	3pU	0.315	0.105	0.210	484.26	3.58E-03	0.0012	0.0003	0.0009	1.79E-08
8/17/2004	WT146	6	3aU	0.219	0.058	0.161	484.26	6.33E-03	0.0004	0.0001	0.0003	5.97E-09
8/17/2004	WT146	6	3bU	1.773	0.086	1.687	484.26	3.52E-02	0.7069	0.0066	0.7002	1.34E-05
8/17/2004	WT146	6	3cU	3.413	0.072	3.341	484.26	9.23E-02	2.0477	0.0118	2.0360	3.91E-05
8/17/2004	WT146	6	3dU	2.424	0.061	2.363	505.66	1.34E-01	1.9547	0.0531	1.9016	3.65E-05

Appendix B (continued)

Table 24 – Results for spike-corrected TSI erosion and ambient concentration, flow, PM-10 cumulative flux, individual PM-10 erosion and ambient net spike mass, and PM-10 net spike mass

Date	Site	Nominal Wind Erodibility Group	Run	spike-corrected TSI Avg erosion conc (mg/m^3)	Avg Tsi Ambient Conc (mg/m3)	concentration difference (mg/m3)	Q (ACFM)	Cumulative PM 10 Flux ton/(acre-hr) = flux in mg / (m2-min) x 1lb/454,000 mg x 1 ton/2000lb x (.305meter / ft)^2 x 43560 ft2/acre x 60 min/hr	Individual PM 10 erosion net spike mass (mg)	Individual PM 10 ambient net spike mass (mg)	Individual PM 10 net spike mass (mg)	PM 10 spike "pulse" (ton/acre)
8/24/2004	WT147	4	1pS	0.277	0.177	0.100	469.49	1.67E-03	0.0285	0.0085	0.0199	3.82E-07
8/24/2004	WT147	4	1aS	0.201	0.001	0.200	469.49	4.99E-03	0.0007	0.1250	0.0000	0.00E+00
8/24/2004	WT147	4	1bS	0.648	0.002	0.647	469.49	1.57E-02	0.2181	0.0509	0.1672	3.21E-06
8/24/2004	WT147	4	1cS	0.688	0.002	0.686	469.49	2.71E-02	0.5759	0.0331	0.5428	1.04E-05
8/24/2004	WT147	4	1dS	0.932	0.004	0.928	506.20	4.36E-02	0.2458	0.0358	0.2100	4.03E-06
8/24/2004	WT147	4	1pU	0.186	0.066	0.120	472.03	2.00E-03	0.0001	0.0004	0.0000	0.00E+00
8/24/2004	WT147	4	1aU	0.084	0.039	0.045	472.03	2.75E-03	0.0002	0.0001	0.0001	1.24E-09
8/24/2004	WT147	4	1bU	0.344	0.030	0.315	472.03	8.01E-03	0.0039	0.0001	0.0037	7.15E-08
8/24/2004	WT147	4	1cU	0.916	0.027	0.888	472.03	2.28E-02	1.0719	0.0029	1.0691	2.05E-05
8/24/2004	WT147	4	1dU	1.720	0.027	1.693	499.79	5.26E-02	0.5776	0.0012	0.5765	1.11E-05
8/24/2004	WT147	4	2pS	0.198	0.057	0.140	472.94	2.35E-03	0.0000	0.0000	0.0000	0.00E+00
8/24/2004	WT147	4	2aS	0.116	0.024	0.092	472.94	3.89E-03	0.0001	0.0129	0.0000	0.00E+00
8/24/2004	WT147	4	2bS	0.421	0.024	0.398	472.94	1.05E-02	0.1636	0.0129	0.1507	2.89E-06
8/24/2004	WT147	4	2cS	0.487	0.024	0.463	472.94	1.83E-02	0.4481	0.0129	0.4352	8.35E-06
8/24/2004	WT147	4	2dS	0.504	0.024	0.480	505.10	2.68E-02	0.0854	0.0129	0.0725	1.39E-06
8/24/2004	WT147	4	2pU	0.181	0.135	0.046	473.89	7.69E-04	0.0004	0.0001	0.0003	5.97E-09
8/24/2004	WT147	4	2aU	0.303	0.095	0.208	473.89	4.25E-03	0.0006	0.0005	0.0000	6.20E-10
8/24/2004	WT147	4	2bU	0.532	0.038	0.494	473.89	1.25E-02	0.4839	0.0015	0.4824	9.26E-06
8/24/2004	WT147	4	2cU	1.430	0.037	1.393	473.89	3.59E-02	0.7501	0.0052	0.7449	1.43E-05
8/24/2004	WT147	4	2dU	1.048	0.086	0.962	494.77	5.26E-02	0.2778	0.0049	0.2729	5.24E-06
8/24/2004	WT147	4	3pS	0.134	0.049	0.085	476.27	1.43E-03	0.0084	0.0025	0.0059	1.14E-07
8/24/2004	WT147	4	3aS	0.062	0.022	0.040	476.27	2.10E-03	0.0064	0.0013	0.0051	9.78E-08
8/24/2004	WT147	4	3bS	0.119	0.032	0.088	476.27	3.57E-03	0.0391	0.0012	0.0379	7.27E-07
8/24/2004	WT147	4	3cS	0.448	0.037	0.411	476.27	1.05E-02	0.1496	0.0013	0.1483	2.85E-06
8/24/2004	WT147	4	3dS	0.715	0.056	0.659	509.15	2.23E-02	0.1012	0.0016	0.0996	1.91E-06
8/24/2004	WT147	4	3pU	0.067	0.080	0.000	478.92	0.00E+00	0.0001	0.0000	0.0001	1.27E-09
8/24/2004	WT147	4	3aU	0.205	0.029	0.176	478.92	2.97E-03	0.0001	0.0001	0.0001	1.04E-09
8/24/2004	WT147	4	3bU	2.021	0.054	1.967	478.92	3.62E-02	0.7542	0.0020	0.7522	1.44E-05
8/24/2004	WT147	4	3cU	2.285	0.141	2.144	478.92	7.25E-02	0.4059	0.0146	0.3913	7.51E-06
8/24/2004	WT147	4	3dU	2.276	0.113	2.163	506.39	1.11E-01	1.6082	0.0148	1.5935	3.06E-05

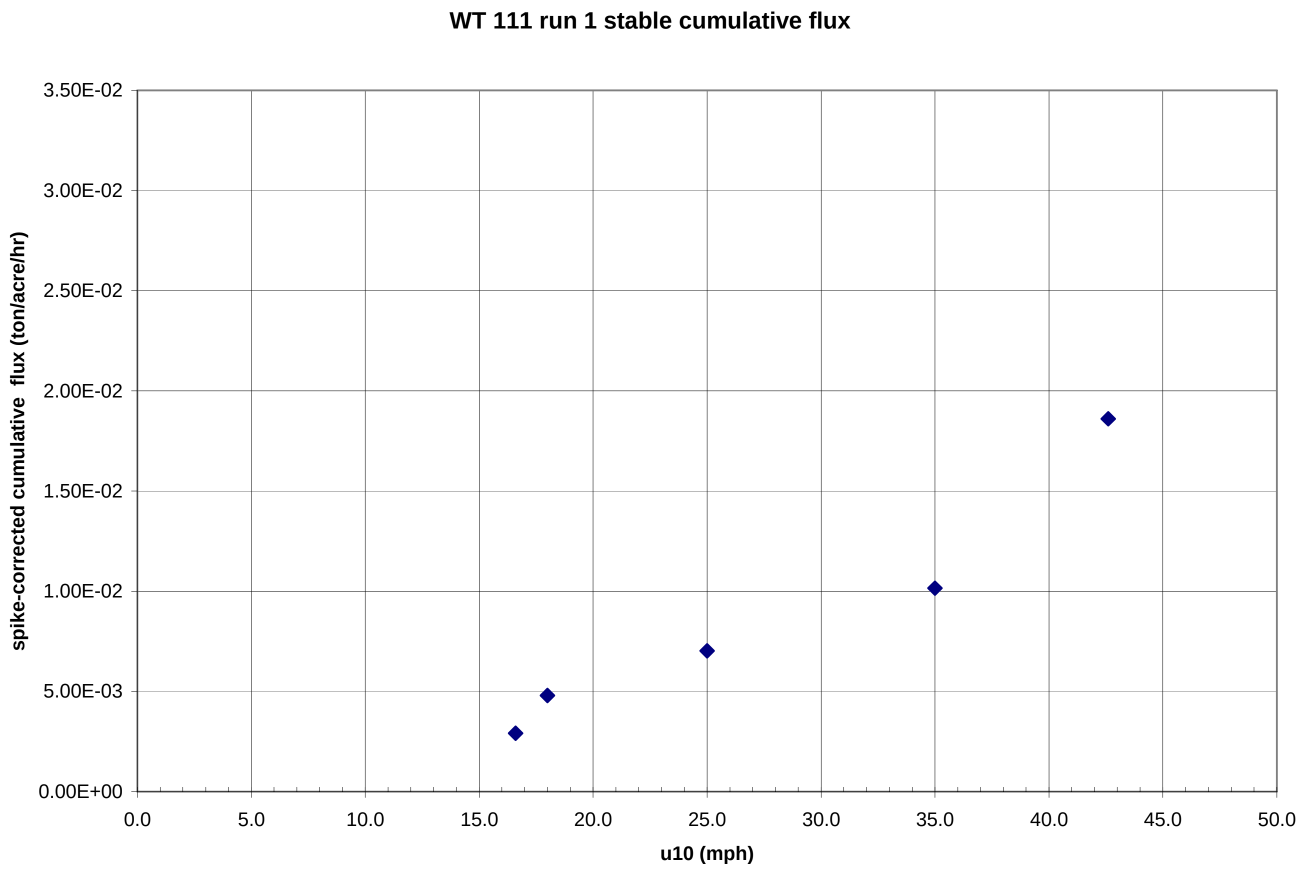
Appendix B (continued)

Table 24 – Results for spike-corrected TSI erosion and ambient concentration, flow, PM-10 cumulative flux, individual PM-10 erosion and ambient net spike mass, and PM-10 net spike mass

Date	Site	Nominal Wind Erodibility Group	Run	spike-corrected TSI Avg erosion conc (mg/m^3)	Avg Tsi Ambient Conc (mg/m3)	concentration difference (mg/m3)	Q (ACFM)	Cumulative PM 10 Flux ton/(acre-hr) = flux in mg / (m2-min) x 1lb/454,000 mg x 1 ton/2000lb x (.305meter / ft)^2 x 43560 ft2/acre x 60 min/hr	Individual PM 10 erosion net spike mass (mg)	Individual PM 10 ambient net spike mass (mg)	Individual PM 10 net spike mass (mg)	PM 10 spike "pulse" (ton/acre)
8/25/2004	WT148	2	1pS	0.358	0.024	0.334	465.36	5.50E-03	0.0259	0.0003	0.0256	4.92E-07
8/25/2004	WT148	2	1aS	0.133	0.170	0.000	465.36	5.50E-03	0.0003	0.0001	0.0002	3.72E-09
8/25/2004	WT148	2	1bS	0.157	0.026	0.130	465.36	7.65E-03	0.0347	0.0013	0.0333	6.40E-07
8/25/2004	WT148	2	1cS	0.400	0.036	0.364	465.36	1.37E-02	0.1763	0.0010	0.1753	3.36E-06
8/25/2004	WT148	2	1dS	0.338	0.089	0.249	496.23	1.80E-02	0.0385	0.0016	0.0369	7.08E-07
8/25/2004	WT148	2	1pU	0.165	0.029	0.136	467.64	2.24E-03	0.0002	0.0000	0.0001	2.87E-09
8/25/2004	WT148	2	1aU	0.118	0.060	0.058	467.64	3.21E-03	0.0001	0.0001	0.0000	9.13E-10
8/25/2004	WT148	2	1bU	0.406	0.030	0.375	467.64	9.42E-03	0.0936	0.0008	0.0928	1.78E-06
8/25/2004	WT148	2	1cU	0.638	0.029	0.609	467.64	1.95E-02	0.4825	0.0013	0.4811	9.23E-06
8/25/2004	WT148	2	1dU	1.673	0.028	1.645	494.47	4.82E-02	0.6402	0.0016	0.6386	1.23E-05
8/25/2004	WT148	2	2pS	0.334	0.033	0.300	469.57	4.99E-03	0.0705	0.0016	0.0689	1.32E-06
8/25/2004	WT148	2	2aS	0.078	0.026	0.051	469.57	5.84E-03	0.0006	0.0001	0.0006	1.09E-08
8/25/2004	WT148	2	2bS	0.207	0.021	0.187	469.57	8.95E-03	0.1036	0.0196	0.0840	1.61E-06
8/25/2004	WT148	2	2cS	0.734	0.022	0.712	469.57	2.08E-02	0.2074	0.0012	0.2061	3.96E-06
8/25/2004	WT148	2	2dS	0.901	0.023	0.878	498.05	3.62E-02	0.2753	0.0011	0.2742	5.26E-06
8/25/2004	WT148	2	2pU	0.180	0.053	0.126	474.24	2.11E-03	0.0002	0.0000	0.0002	3.62E-09
8/25/2004	WT148	2	2aU	0.100	0.017	0.083	474.24	3.50E-03	0.0001	0.0001	0.0000	9.79E-11
8/25/2004	WT148	2	2bU	0.640	0.018	0.622	474.24	1.39E-02	0.1176	0.0011	0.1165	2.24E-06
8/25/2004	WT148	2	2cU	0.504	0.023	0.481	474.24	2.20E-02	0.2143	0.0035	0.2107	4.04E-06
8/25/2004	WT148	2	2dU	0.377	0.016	0.361	506.98	2.84E-02	0.0140	0.0004	0.0137	2.62E-07
8/25/2004	WT148	2	3pS	0.154	0.023	0.131	475.31	2.20E-03	0.0337	0.0015	0.0322	6.18E-07
8/25/2004	WT148	2	3aS	0.254	0.040	0.214	475.31	5.80E-03	0.0253	0.0008	0.0245	4.71E-07
8/25/2004	WT148	2	3bS	0.211	0.026	0.186	475.31	8.92E-03	0.0883	0.0038	0.0845	1.62E-06
8/25/2004	WT148	2	3cS	0.256	0.026	0.230	475.31	1.28E-02	0.2238	0.0028	0.2210	4.24E-06
8/25/2004	WT148	2	3dS	0.551	0.029	0.521	506.84	2.21E-02	0.0571	0.0008	0.0562	1.08E-06
8/25/2004	WT148	2	3pU	0.305	0.027	0.279	473.52	4.67E-03	0.0003	0.0000	0.0003	5.90E-09
8/25/2004	WT148	2	3aU	0.040	0.025	0.015	473.52	4.92E-03	0.0002	0.0001	0.0002	3.03E-09
8/25/2004	WT148	2	3bU	0.099	0.026	0.073	473.52	6.15E-03	0.1505	0.0094	0.1411	2.71E-06
8/25/2004	WT148	2	3cU	0.854	0.032	0.822	473.52	1.99E-02	0.3807	0.0027	0.3780	7.25E-06
8/25/2004	WT148	2	3dU	0.754	0.026	0.728	514.21	3.31E-02	0.0493	0.0009	0.0484	9.29E-07

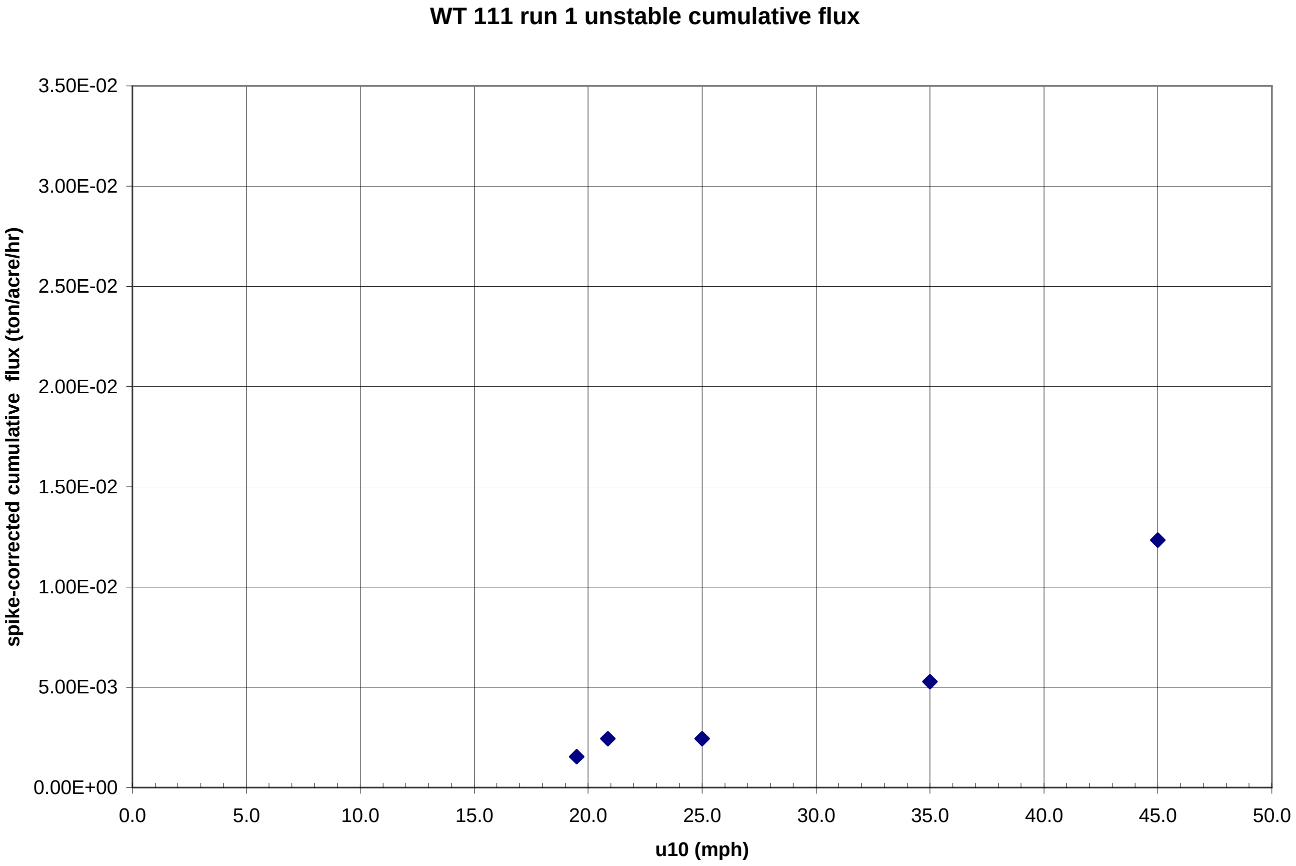
Appendix C – Plots of cumulative flux vs. wind speed, individual sites

Figure 24 – U10 versus spike corrected flux – WT 111 1S



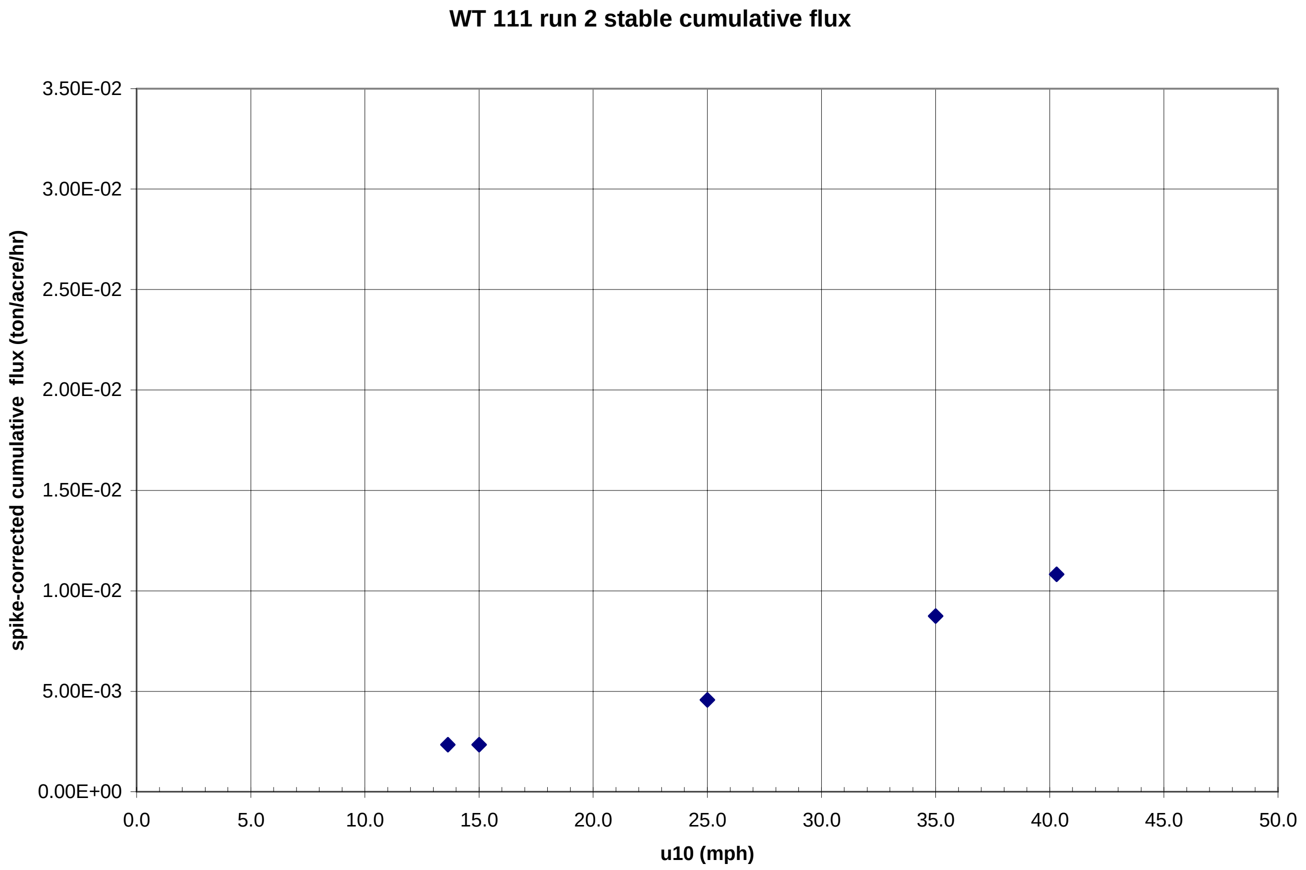
Appendix C (continued)

Figure 25 – U10 versus spike corrected flux – WT 111 1U



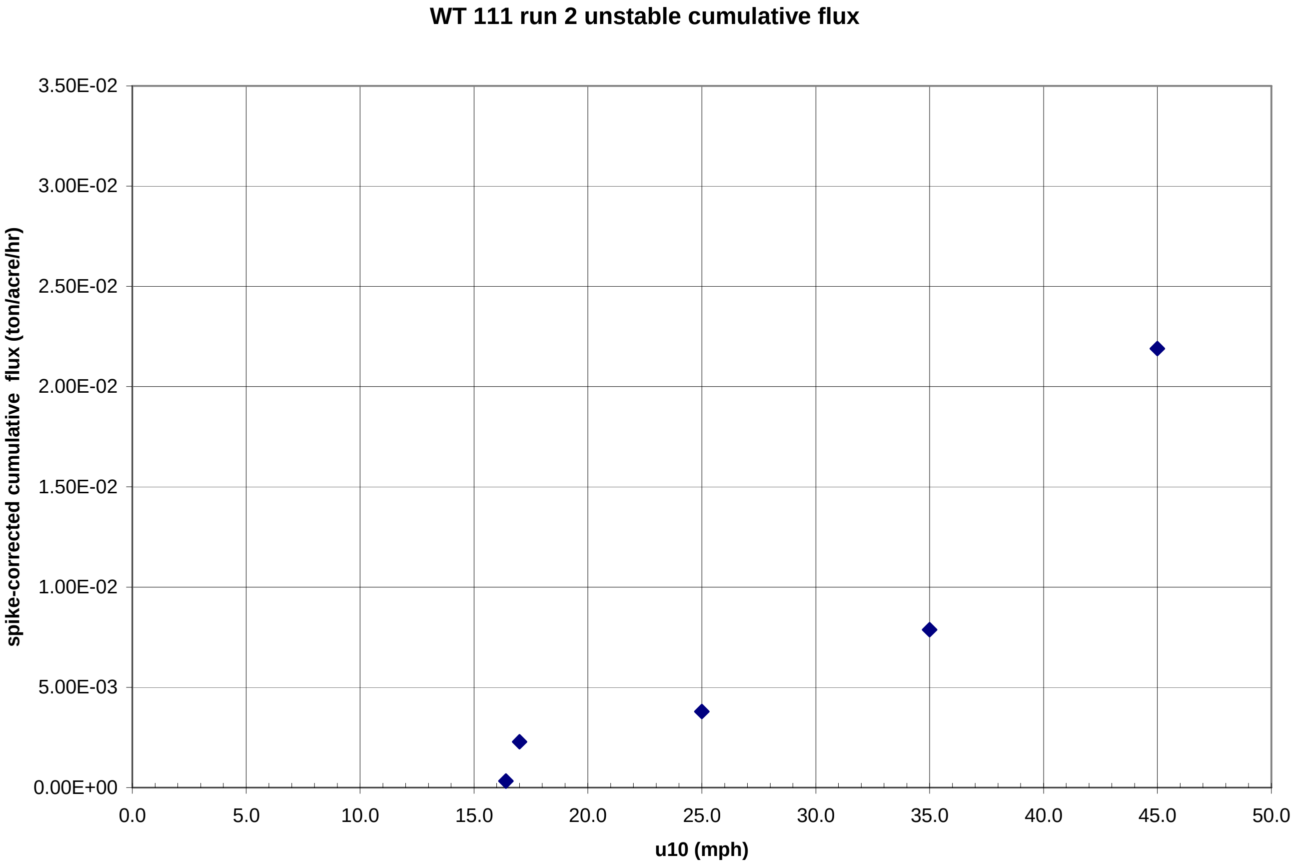
Appendix C (continued)

Figure 26 – U10 versus spike corrected flux – WT 111 2S



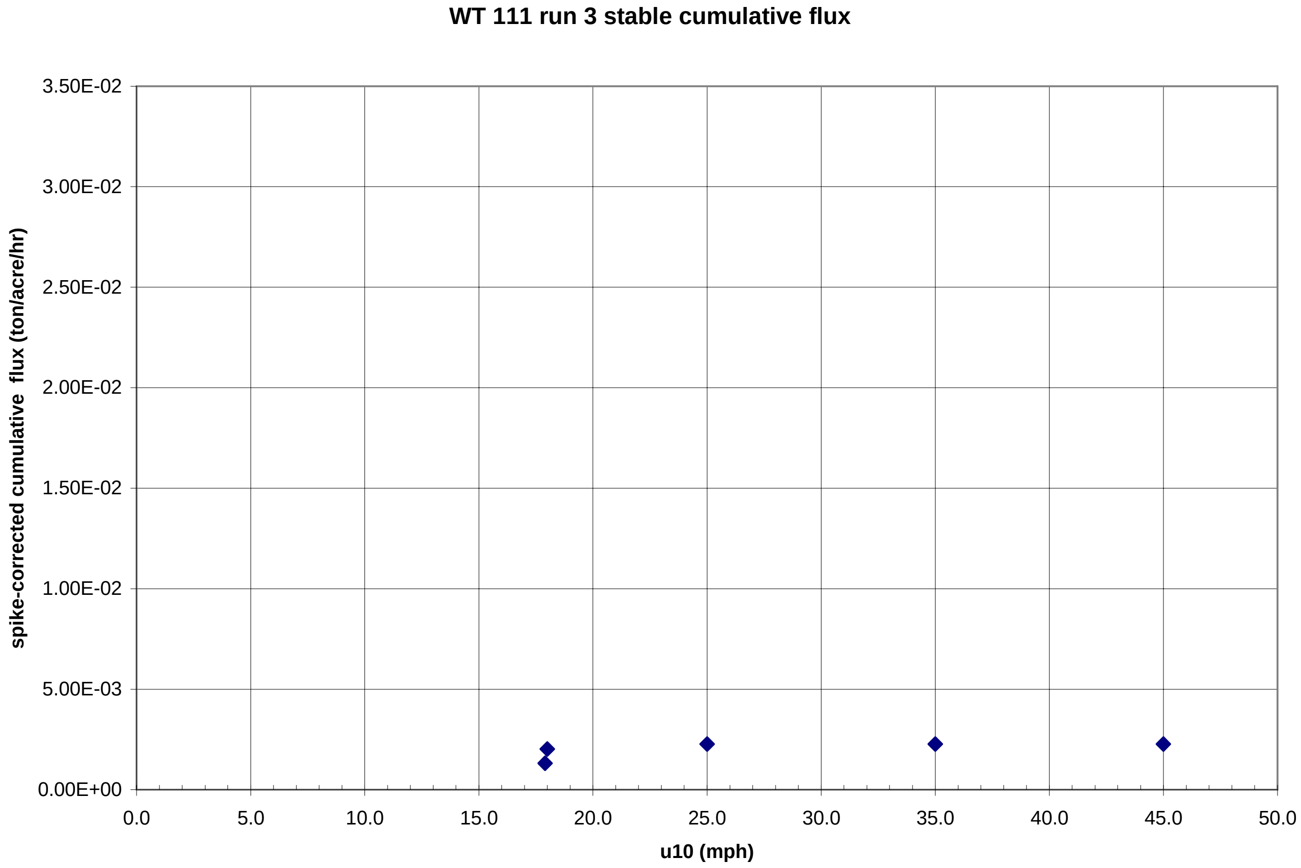
Appendix C (continued)

Figure 27 – U10 versus spike corrected flux – WT 111 2U



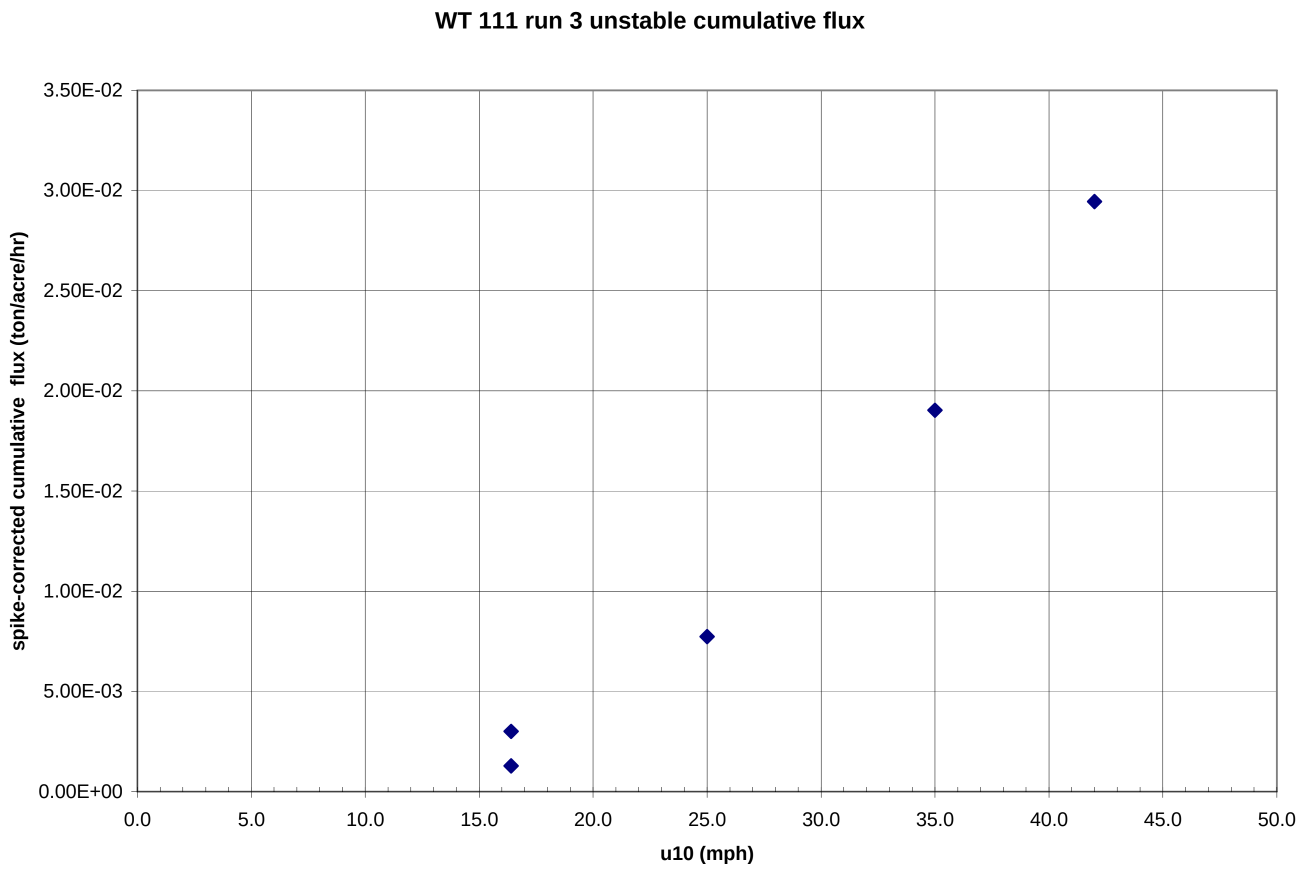
Appendix C (continued)

Figure 28 – U10 versus spike corrected flux – WT 111 3S


WT 111 run 3 stable cumulative flux

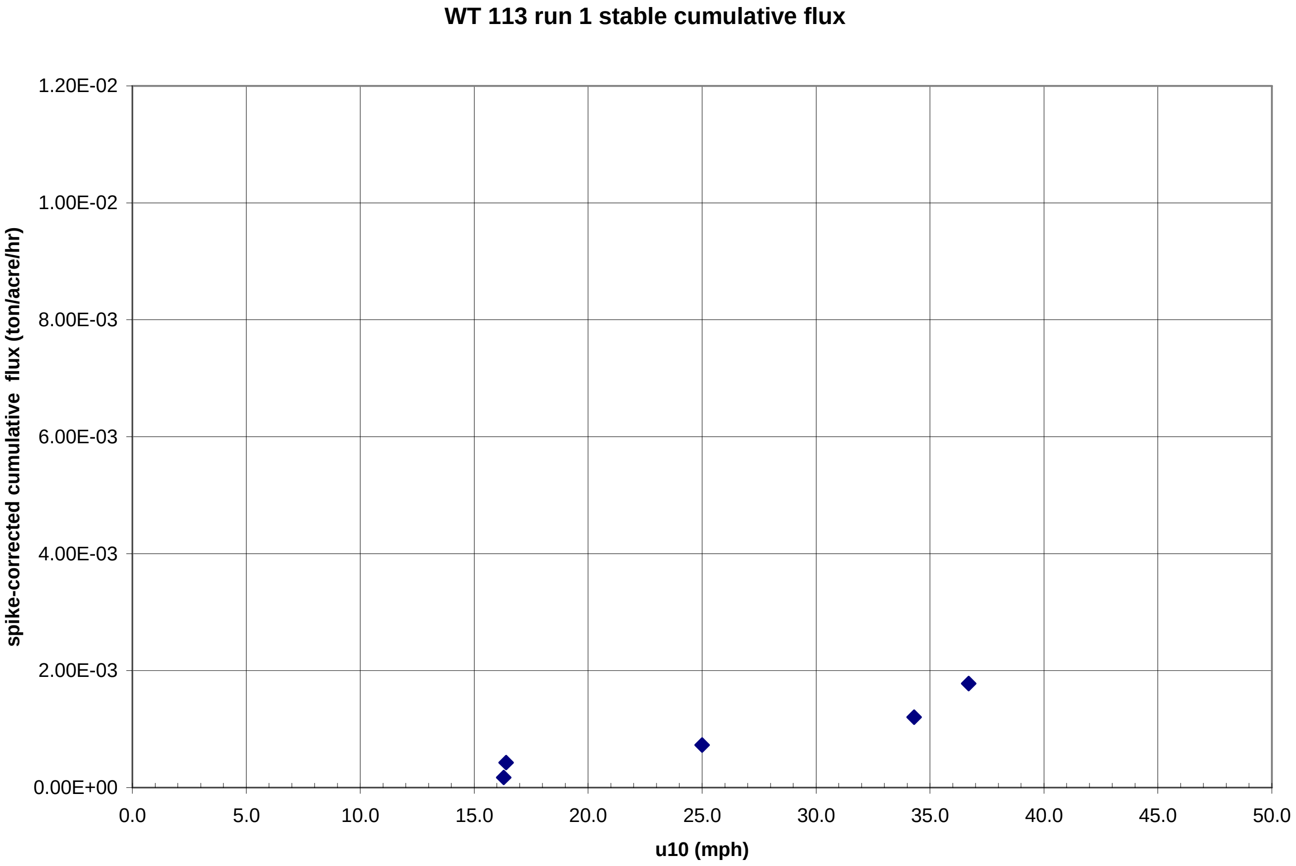
Appendix C (continued)

Figure 29 – U10 versus spike corrected flux – WT 111 3U



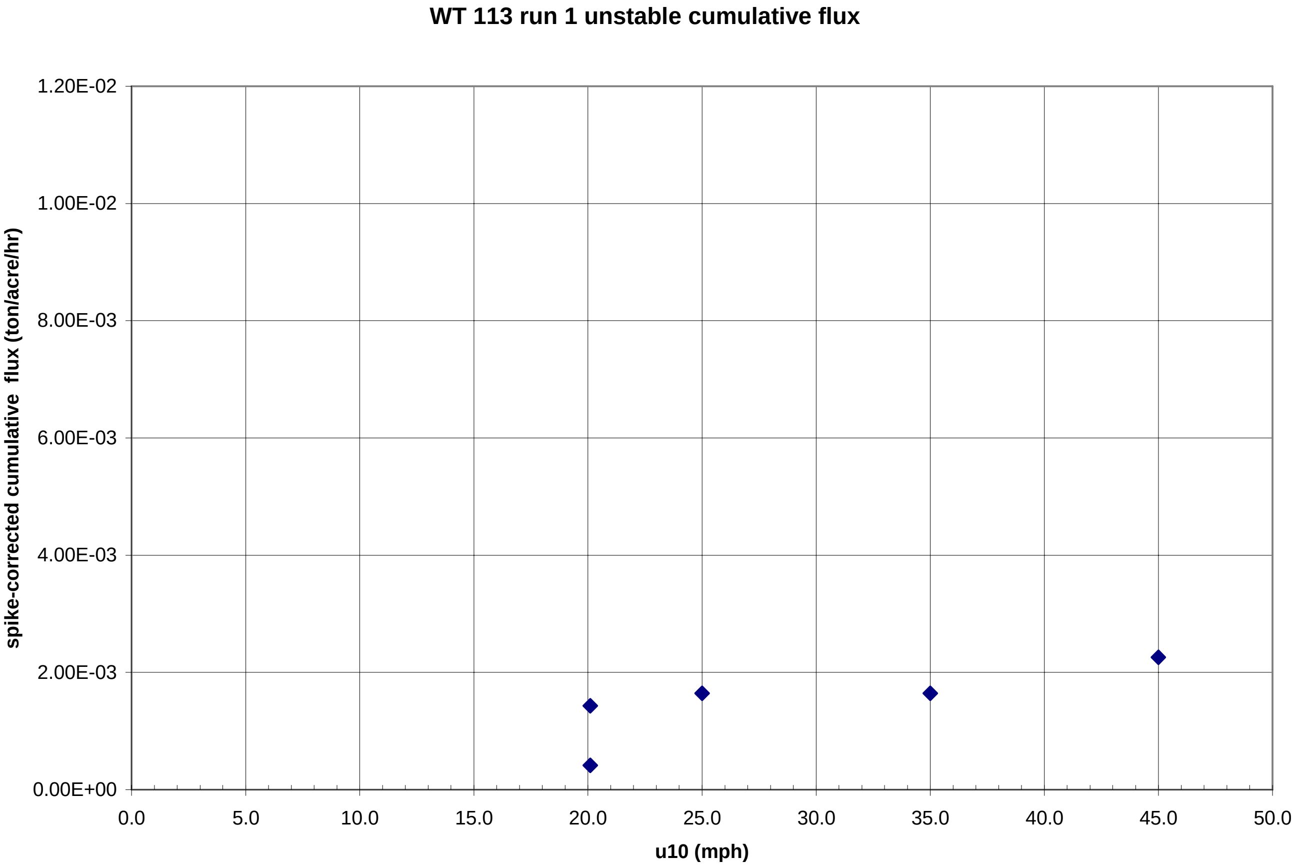
Appendix C (continued)

Figure 30 – U10 versus spike corrected flux – WT 113 1S



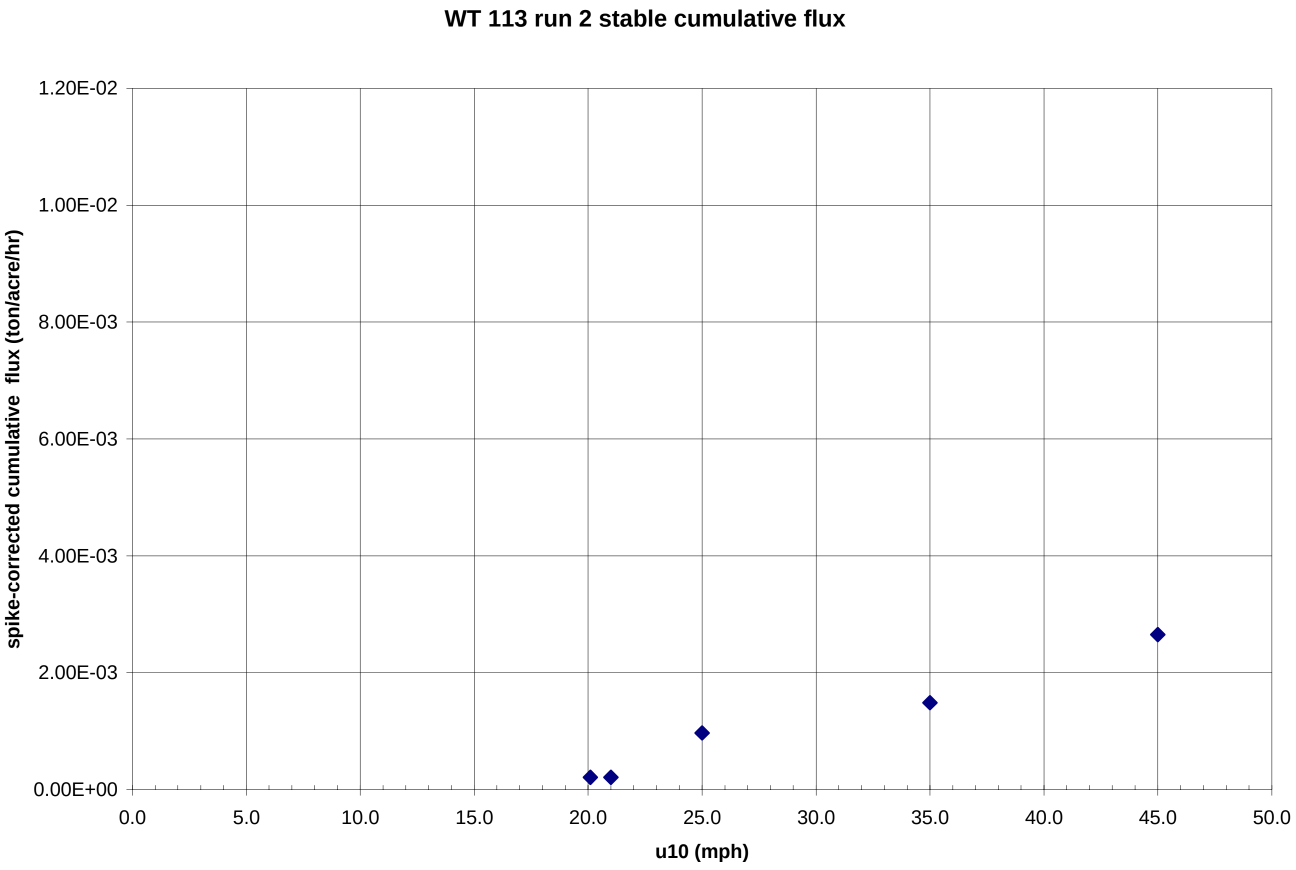
Appendix C (continued)

Figure 31 – U10 versus spike corrected flux – WT 113 1U



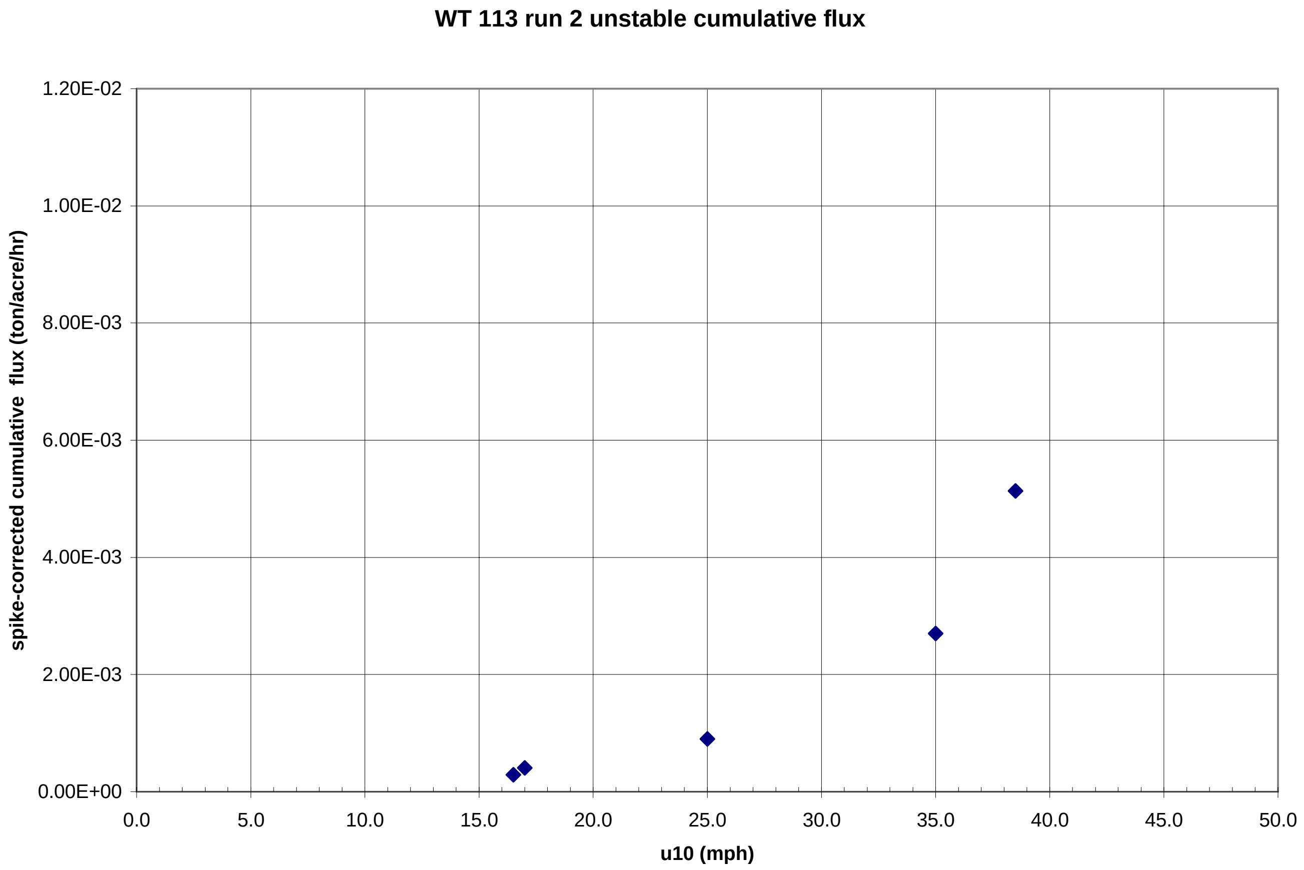
Appendix C (continued)

Figure 32 – U10 versus spike corrected flux – WT 113 2S



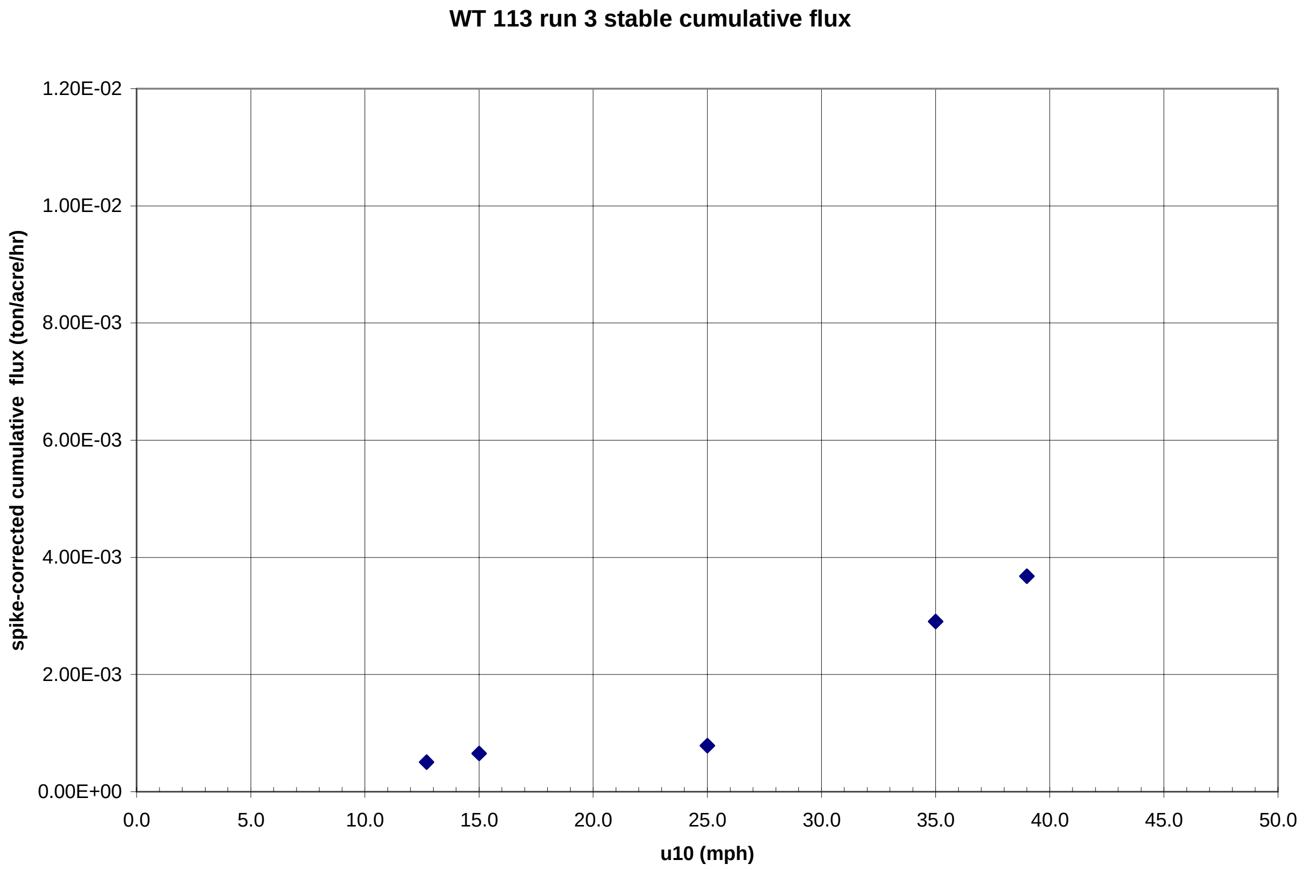
Appendix C (continued)

Figure 33 – U10 versus spike corrected flux – WT 113 2U



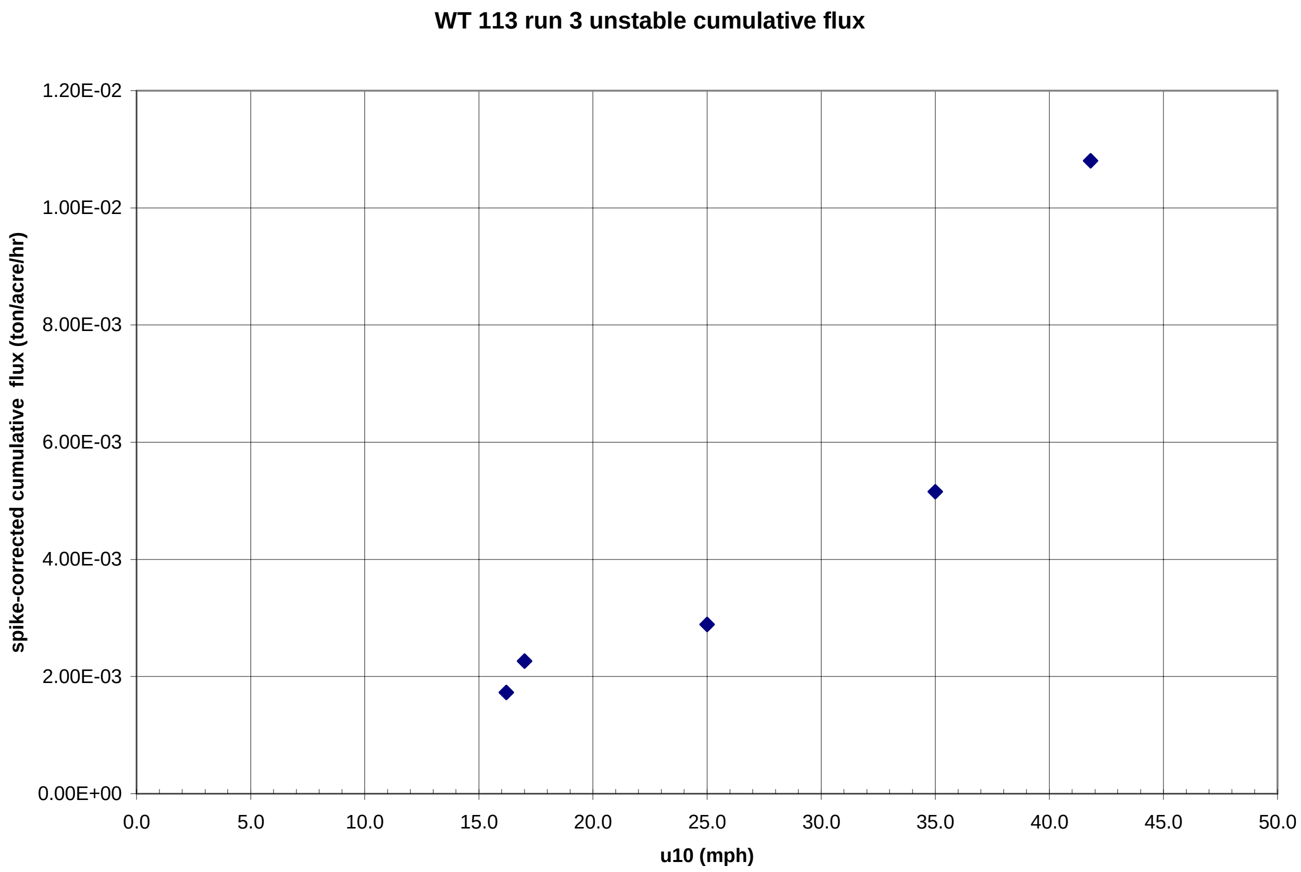
Appendix C (continued)

Figure 34 – U10 versus spike corrected flux – WT 113 3S



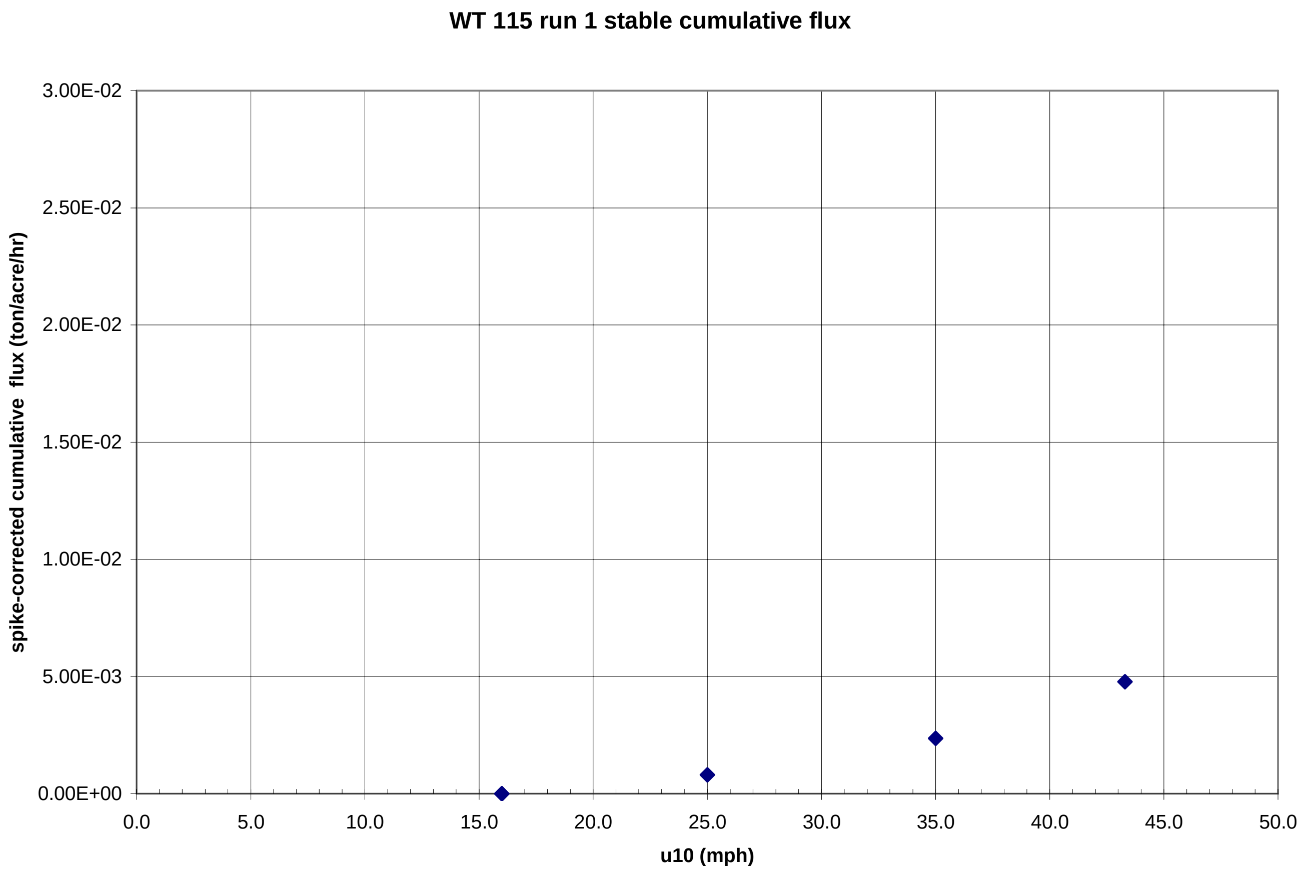
Appendix C (continued)

Figure 35 – U10 versus spike corrected flux – WT 113 3U



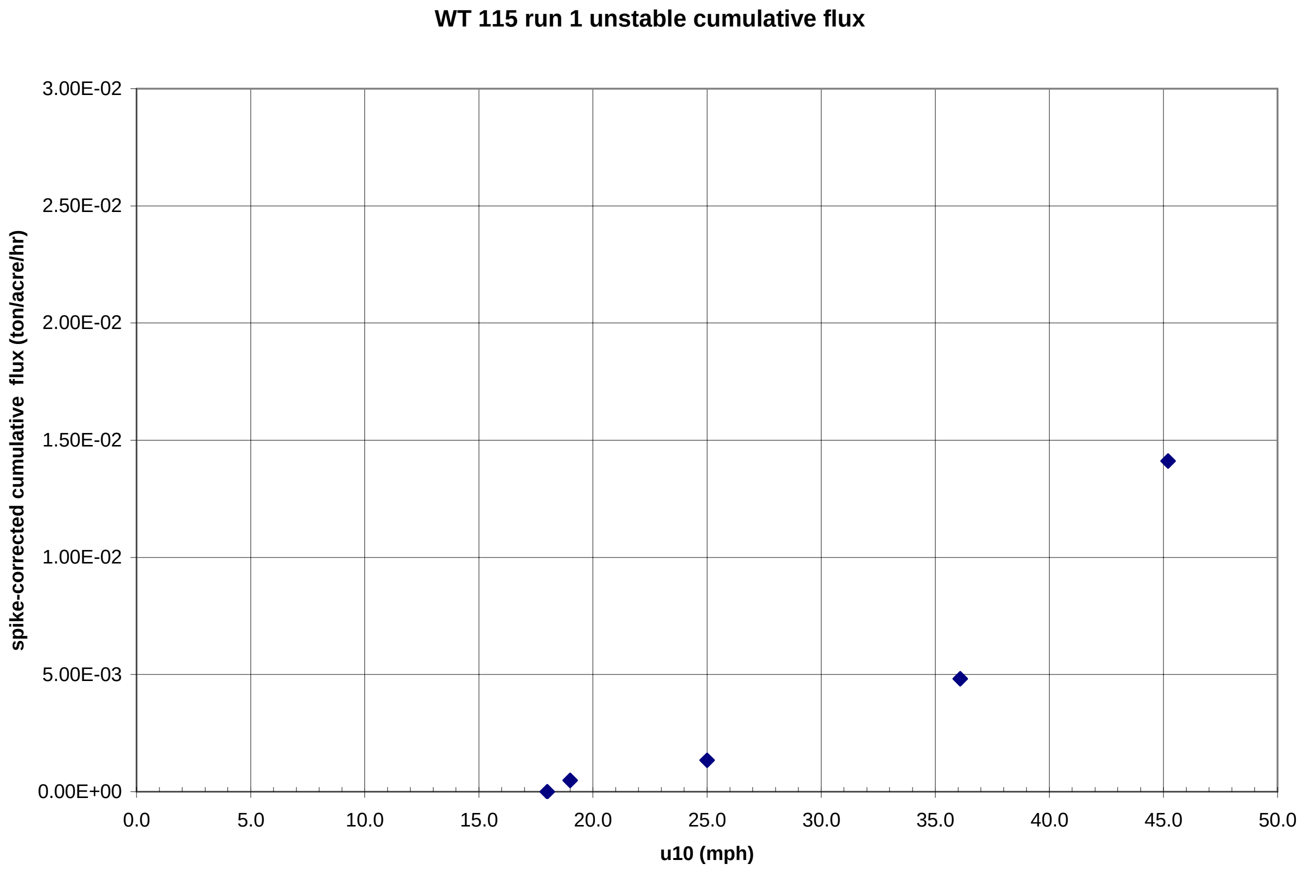
Appendix C (continued)

Figure 36 – U10 versus spike corrected flux – WT 115 1S



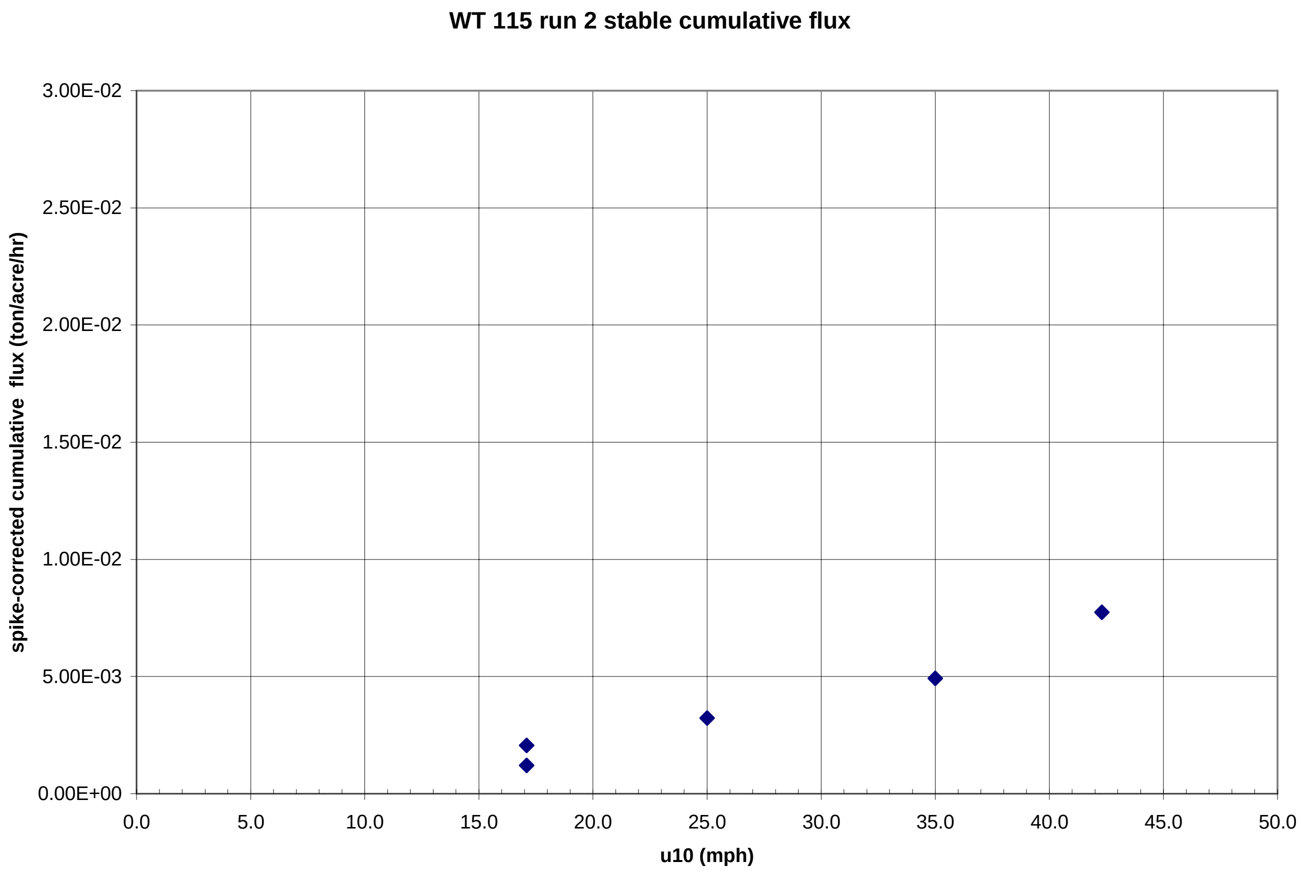
Appendix C (continued)

Figure 37 – U10 versus spike corrected flux – WT 115 1U



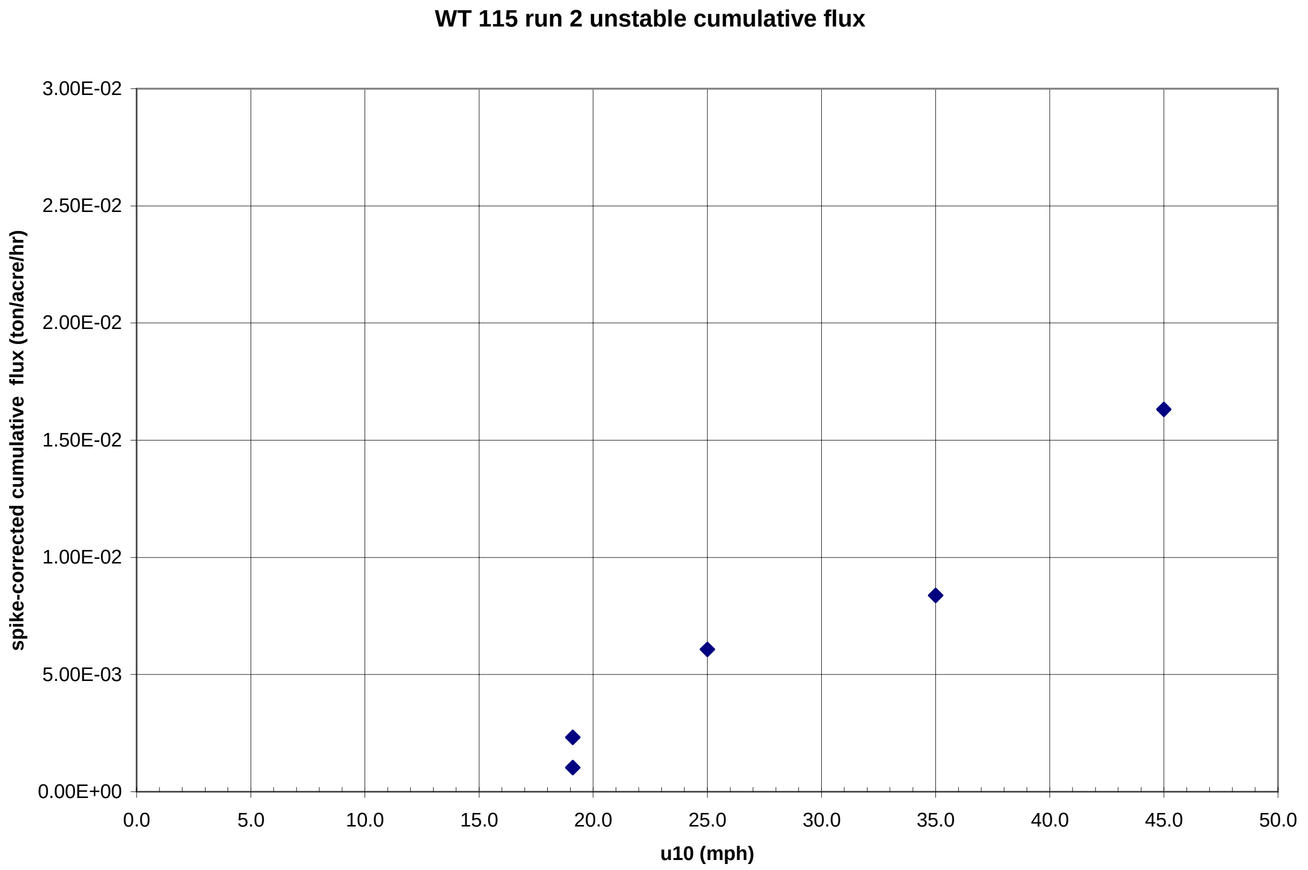
Appendix C (continued)

Figure 38 – U10 versus spike corrected flux – WT 115 2S



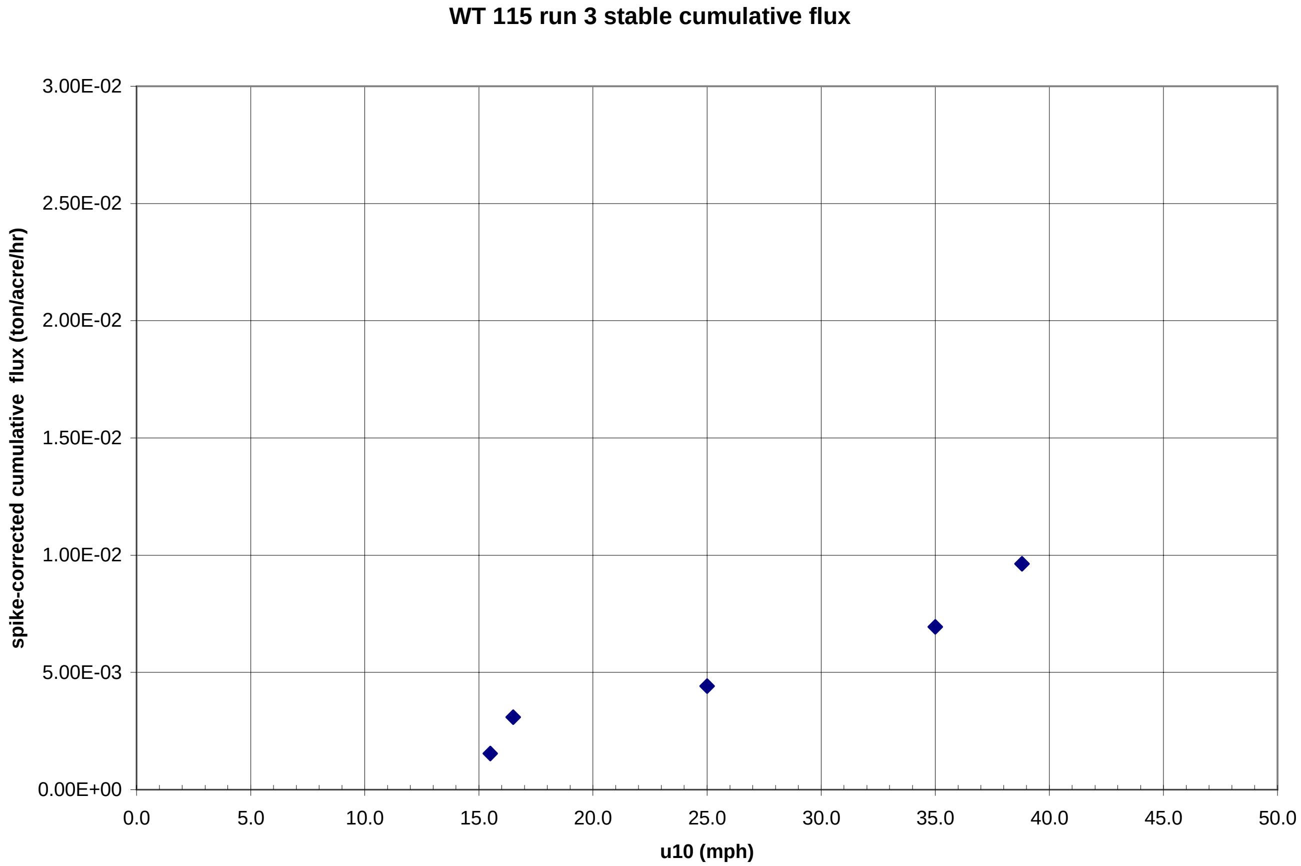
Appendix C (continued)

Figure 39 – U10 versus spike corrected flux – WT 115 2U



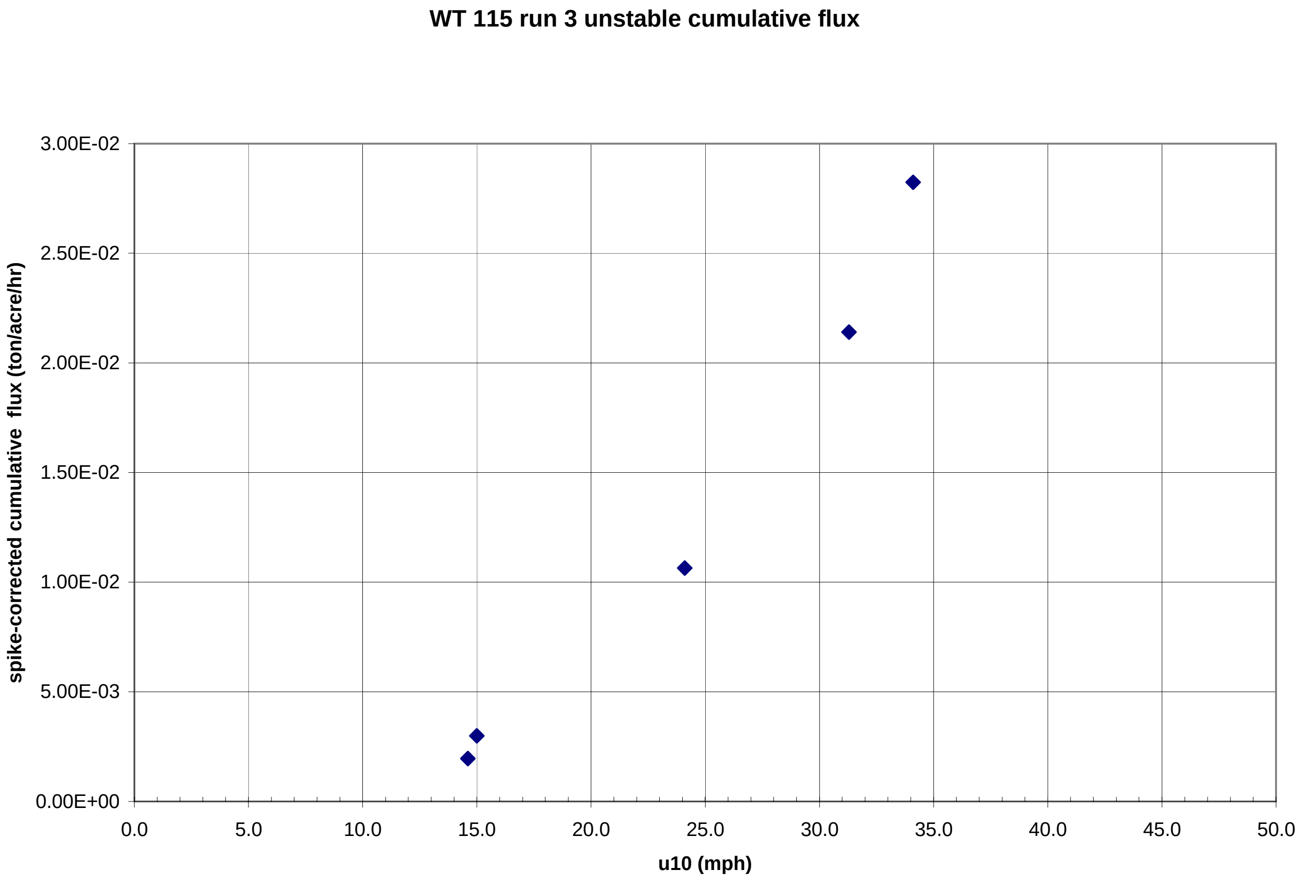
Appendix C (continued)

Figure 40 – U10 versus spike corrected flux – WT 115 3S



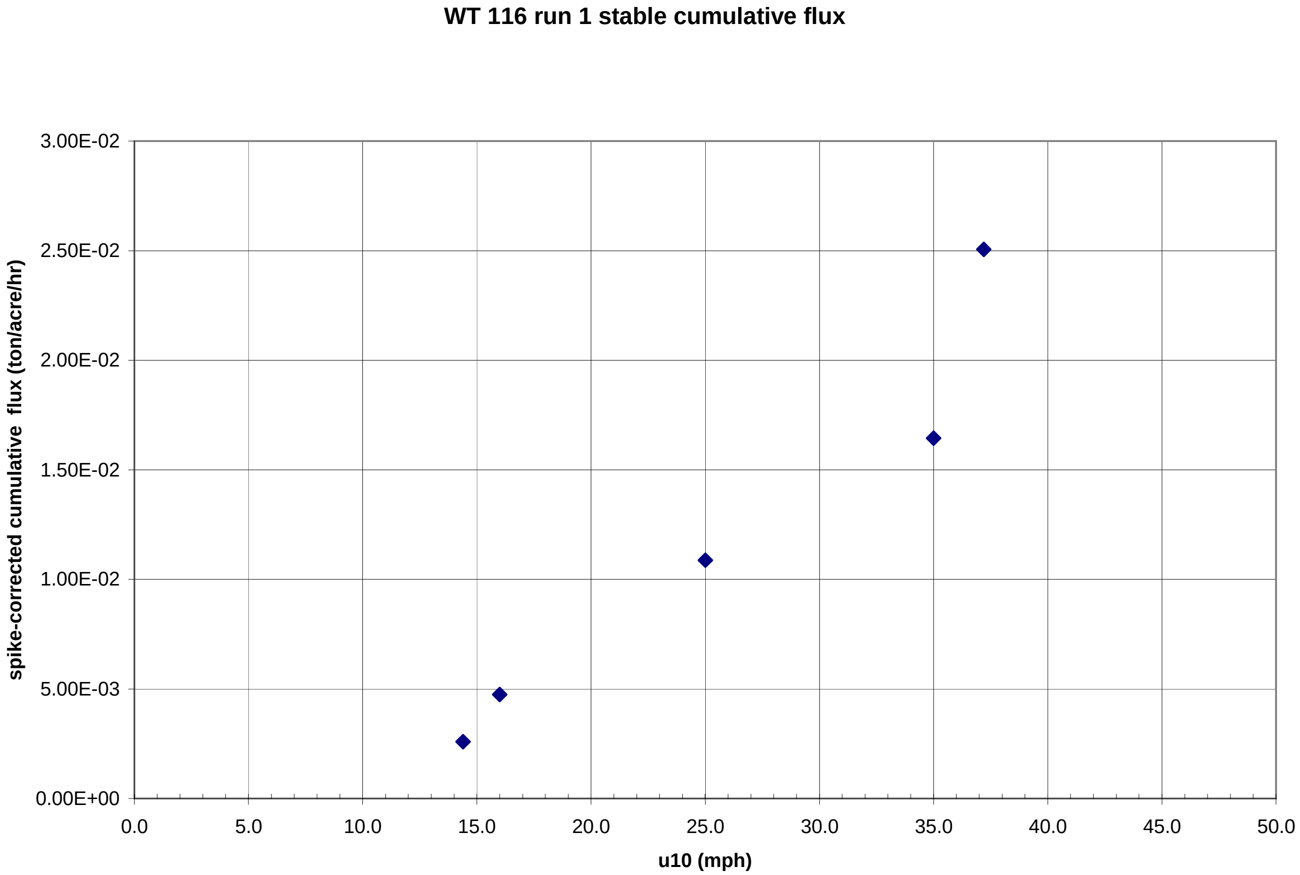
Appendix C (continued)

Figure 41 – U10 versus spike corrected flux – WT 115 3U



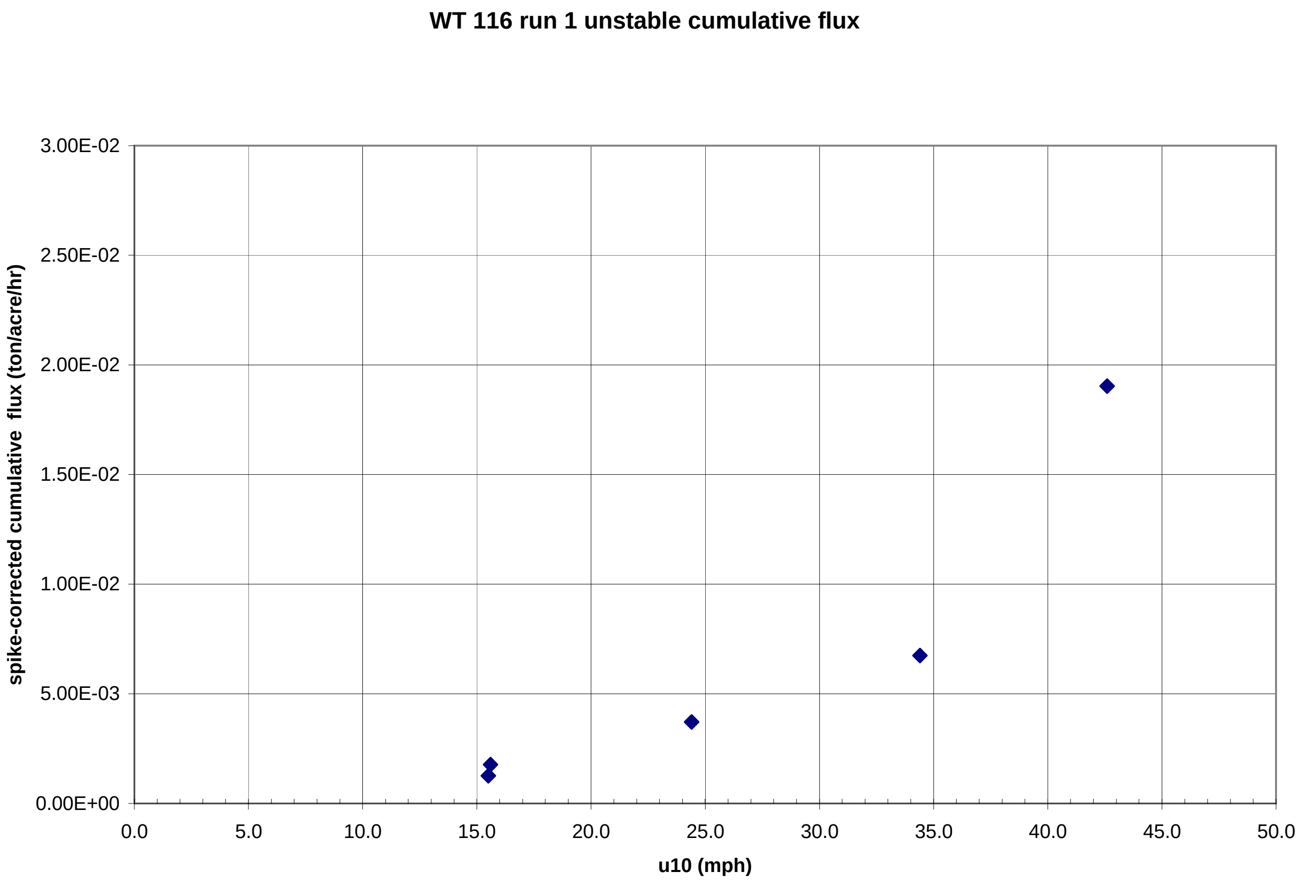
Appendix C (continued)

Figure 42 – U10 versus spike corrected flux – WT 116 1S



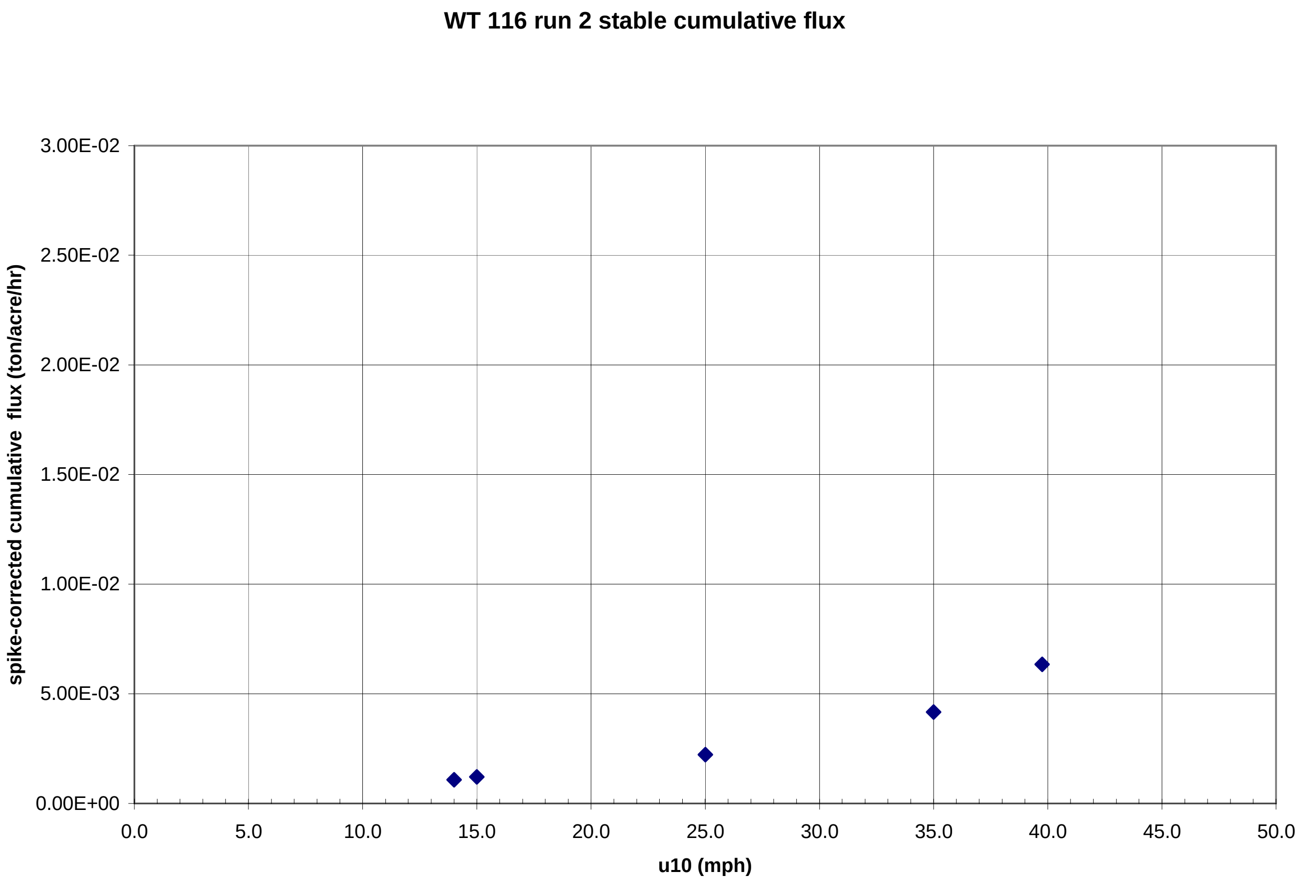
Appendix C (continued)

Figure 43 – U10 versus spike corrected flux – WT 116 1U



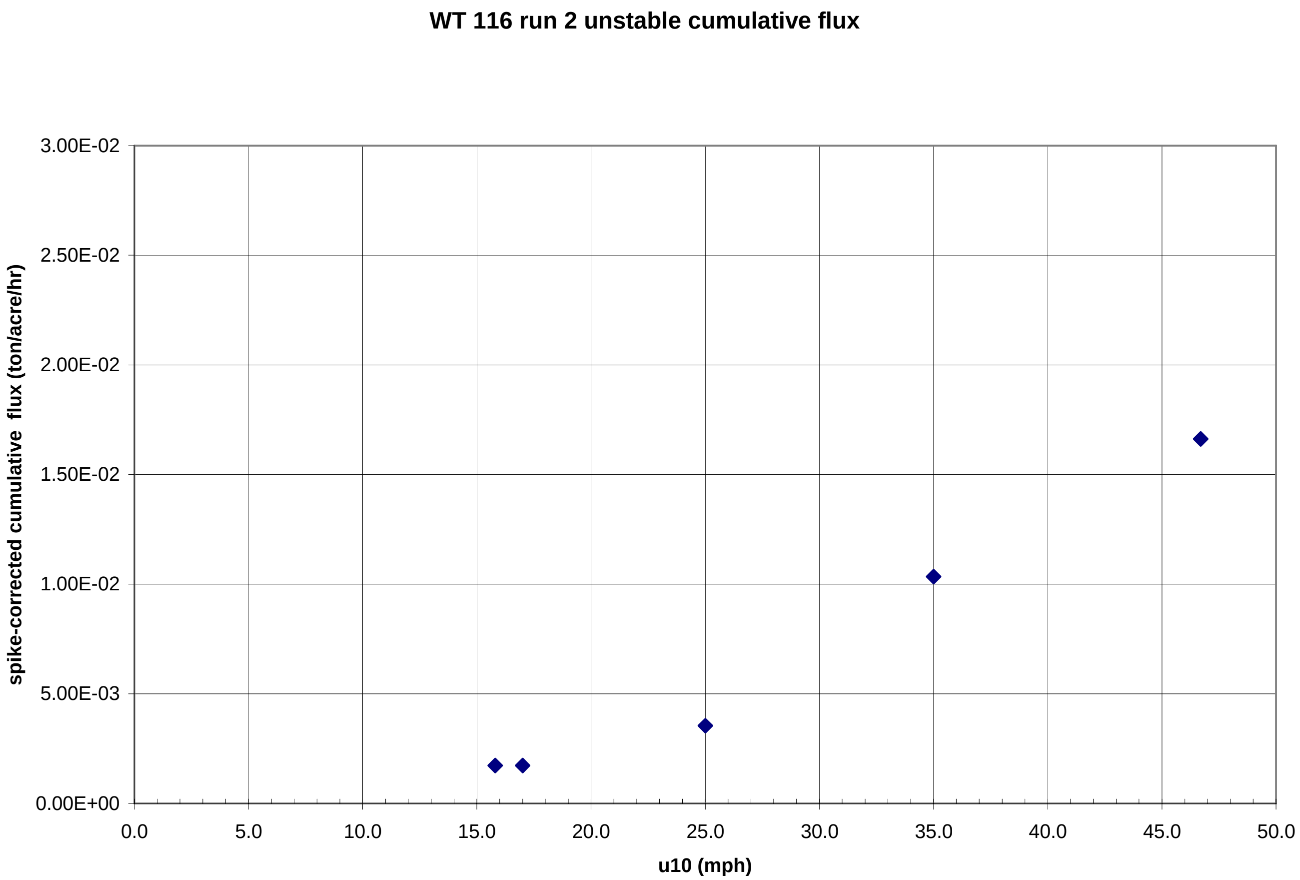
Appendix C (continued)

Figure 44 – U10 versus spike corrected flux – WT 116 2S



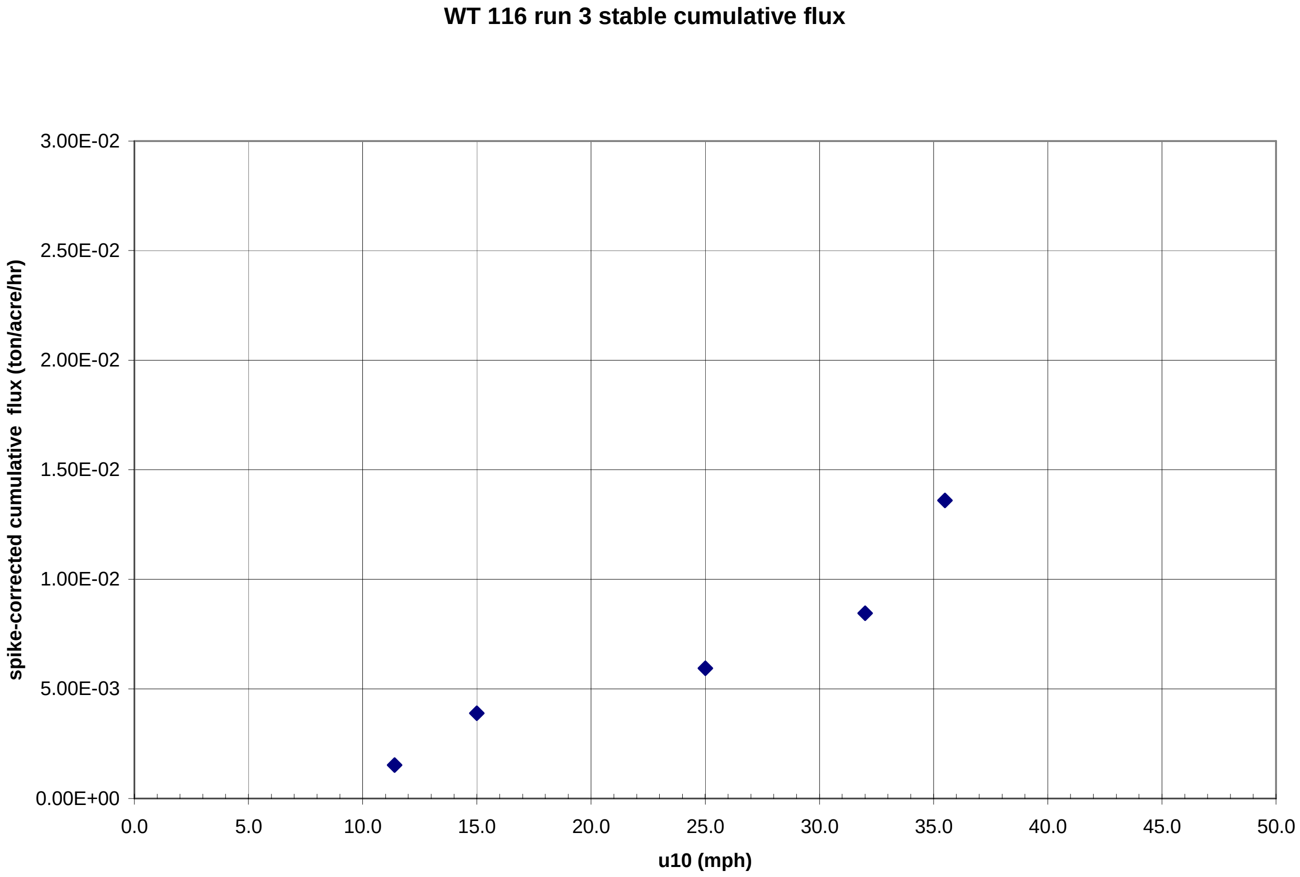
Appendix C (continued)

Figure 45 – U10 versus spike corrected flux – WT 116 2U



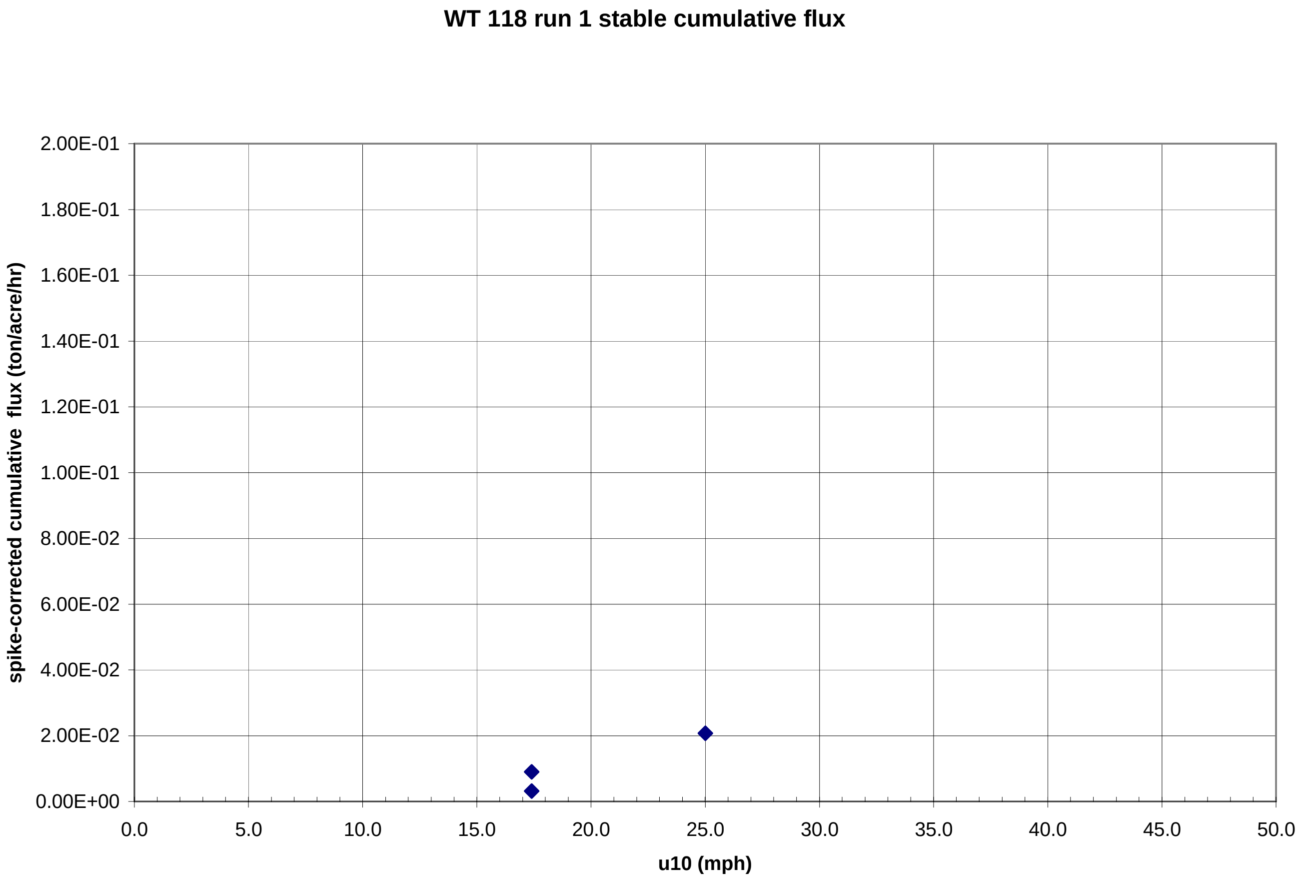
Appendix C (continued)

Figure 46 – U10 versus spike corrected flux – WT 116 3S



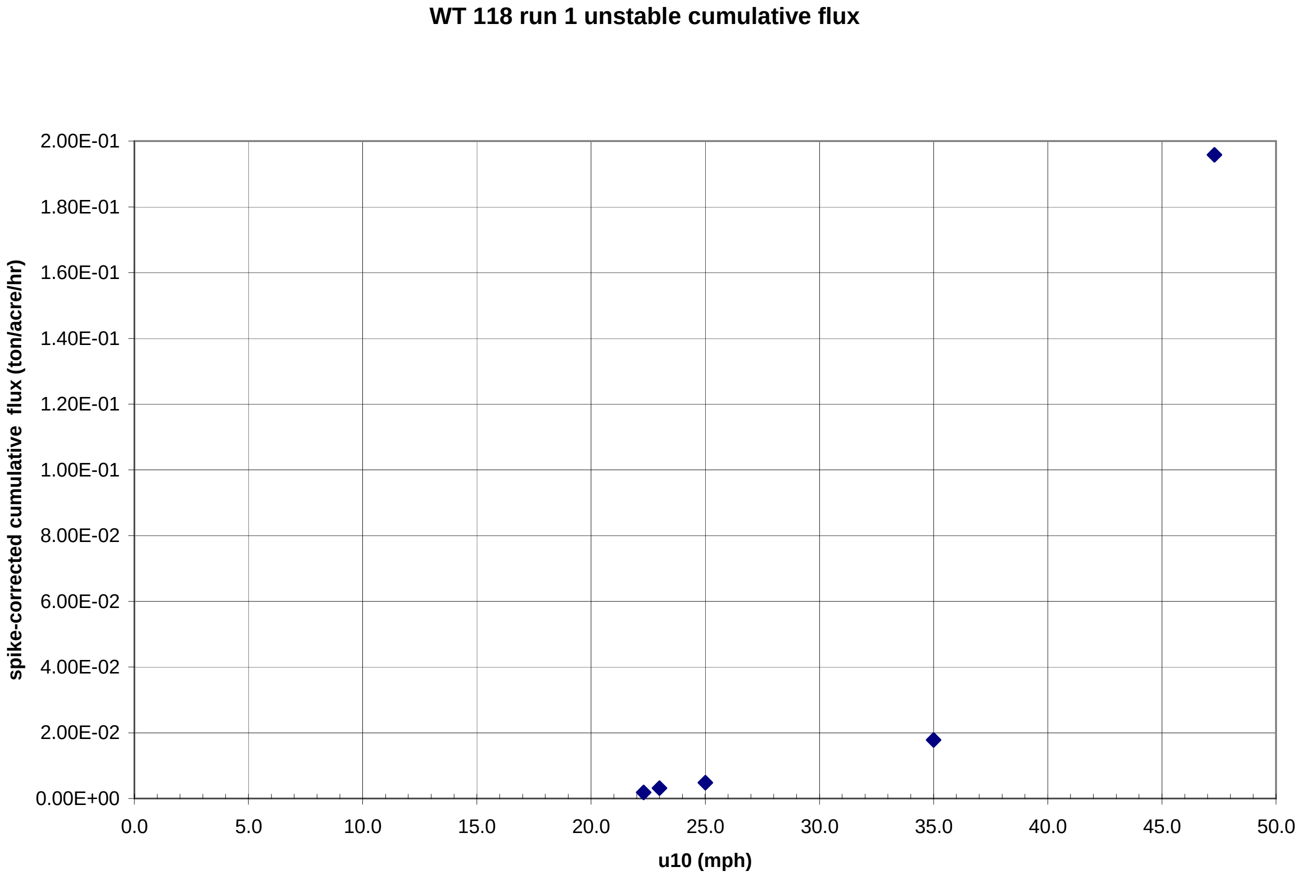
Appendix C (continued)

Figure 47 – U10 versus spike corrected flux – WT 118 1S



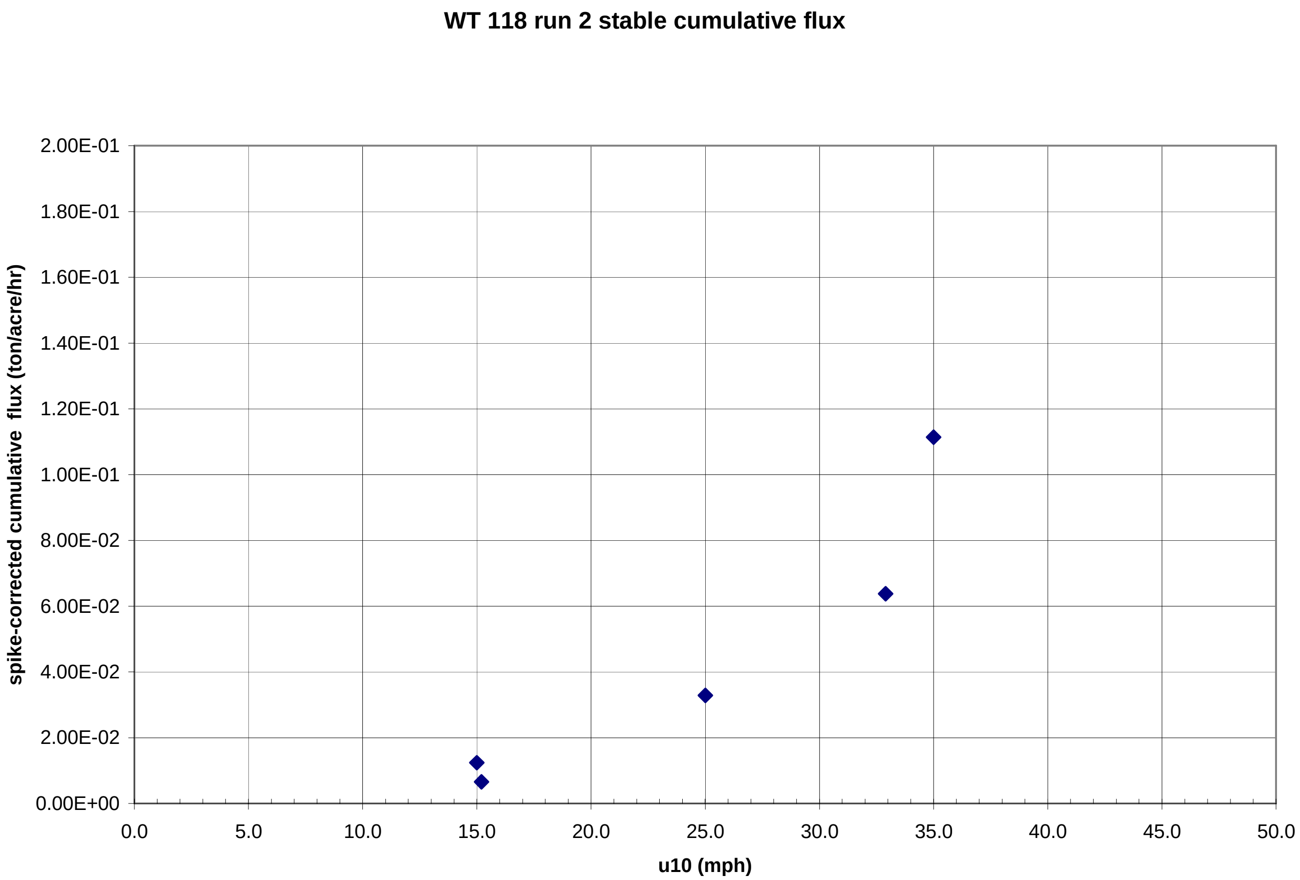
Appendix C (continued)

Figure 48 – U10 versus spike corrected flux – WT 118 1U



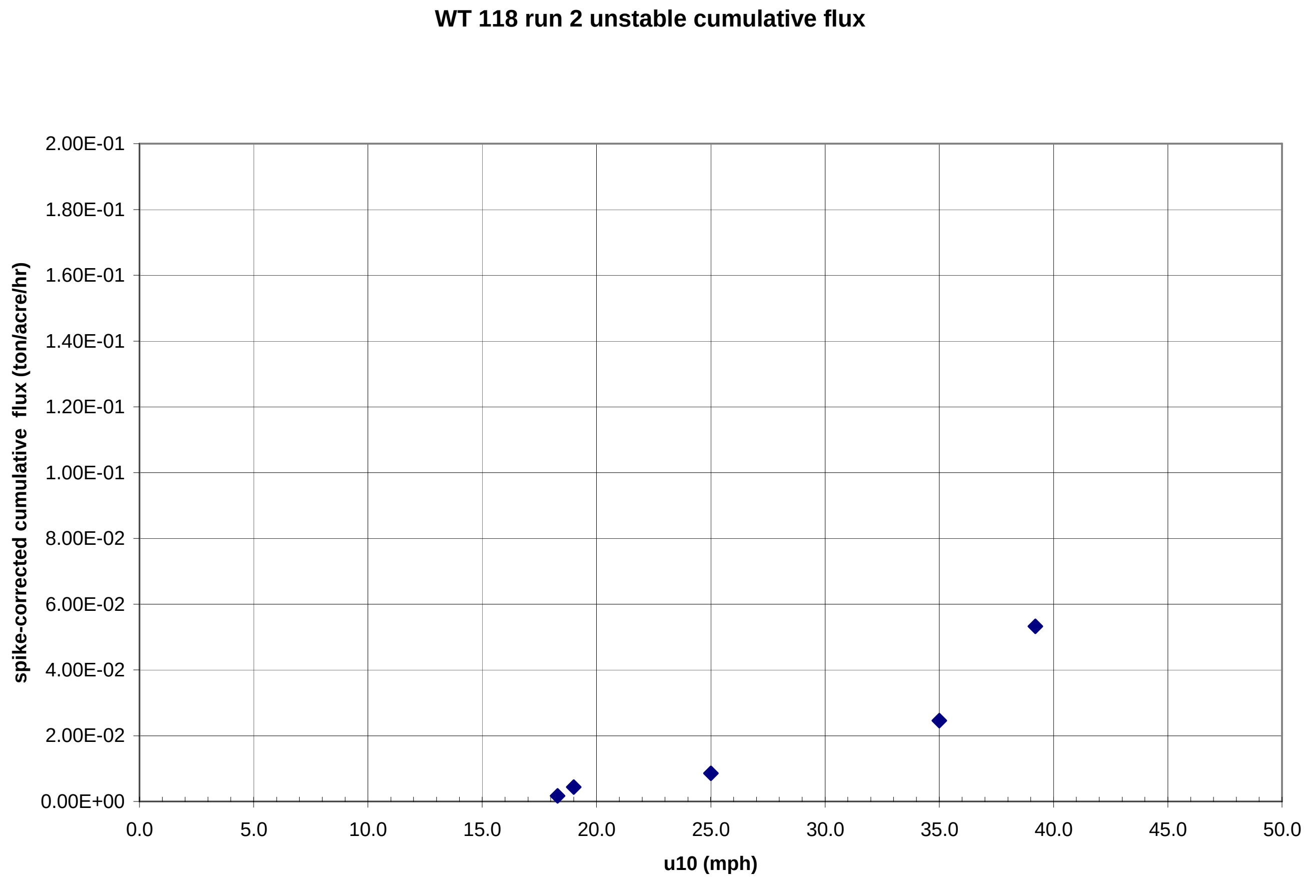
Appendix C (continued)

Figure 49 – U10 versus spike corrected flux – WT 118 2S



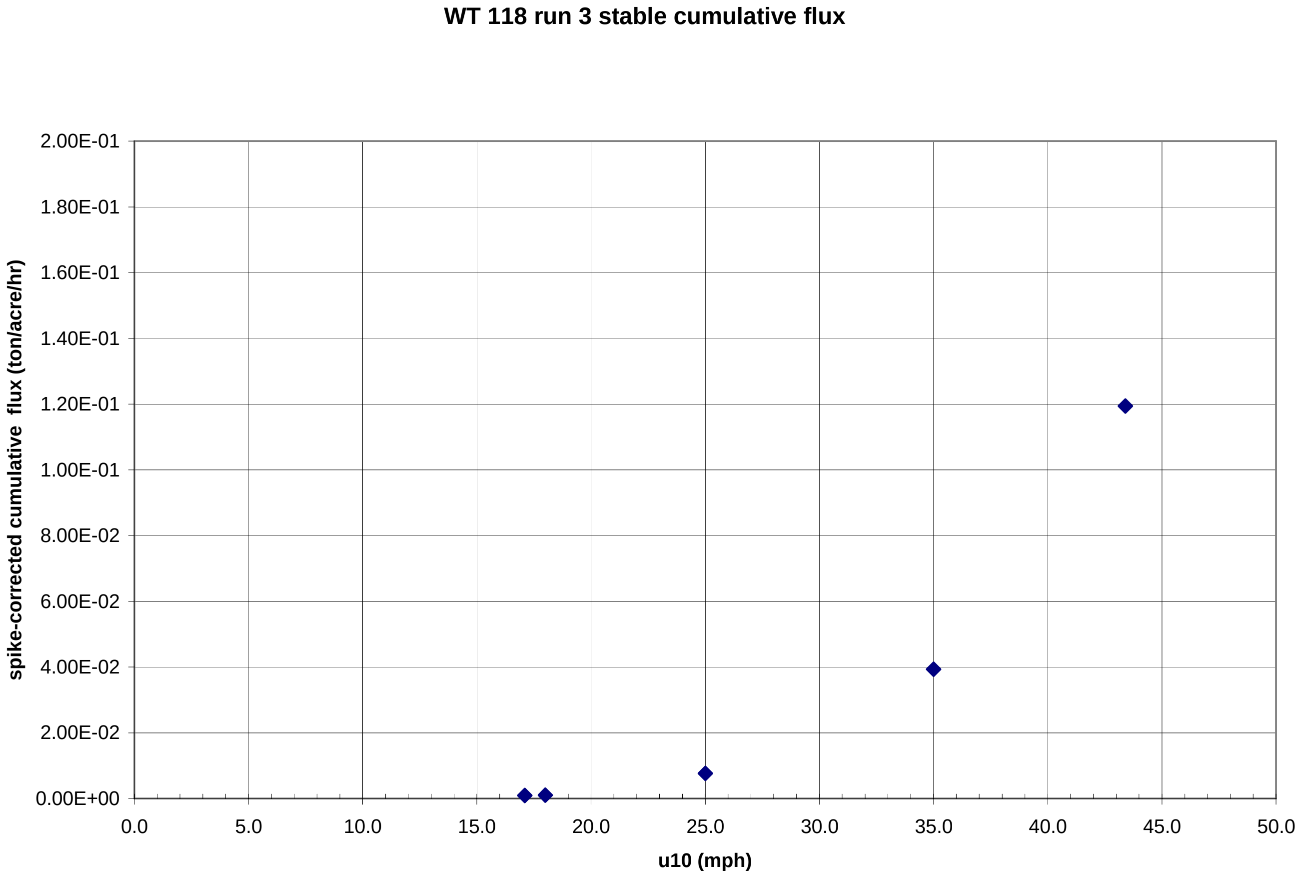
Appendix C (continued)

Figure 50 – U10 versus spike corrected flux – WT 118 2U



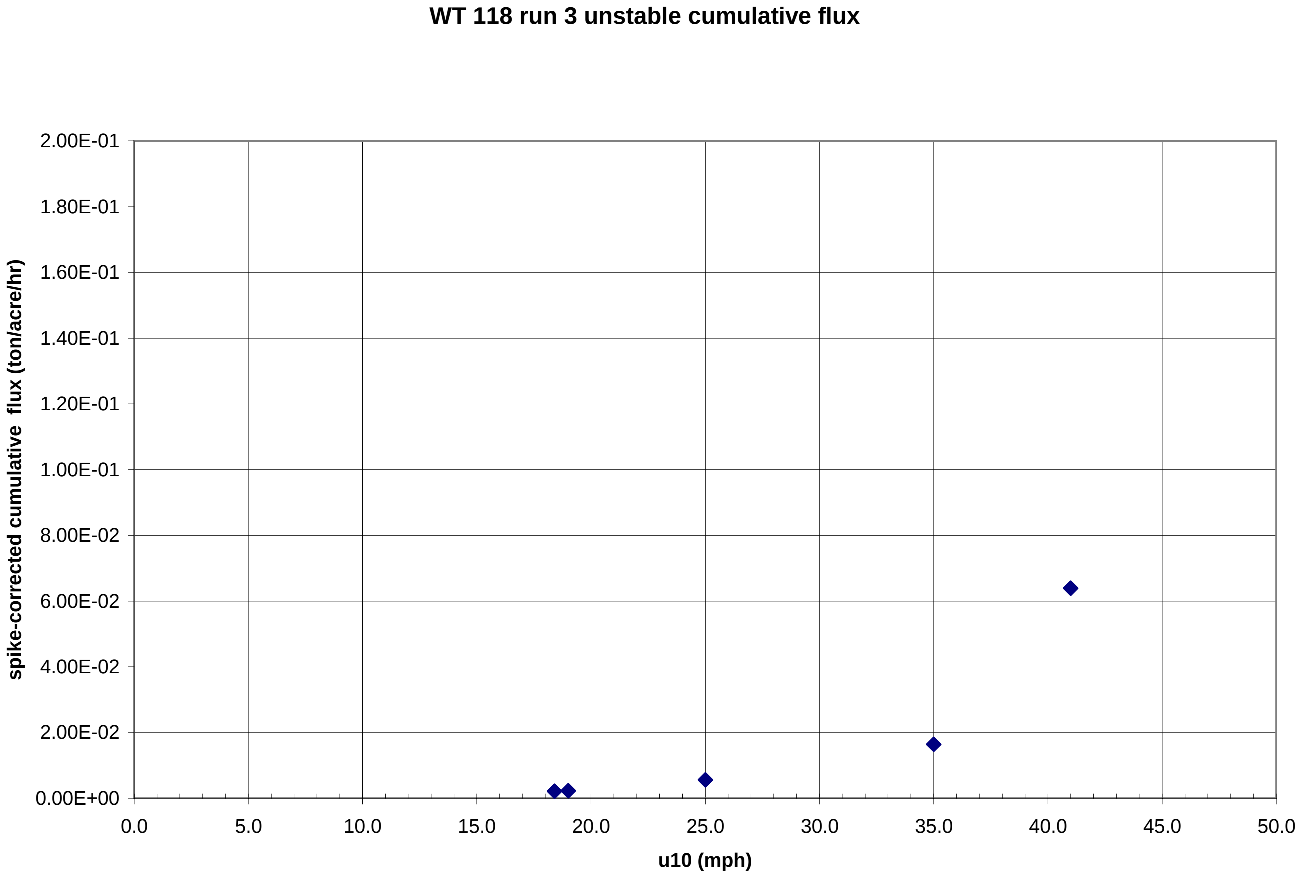
Appendix C (continued)

Figure 51 – U10 versus spike corrected flux – WT 118 3S



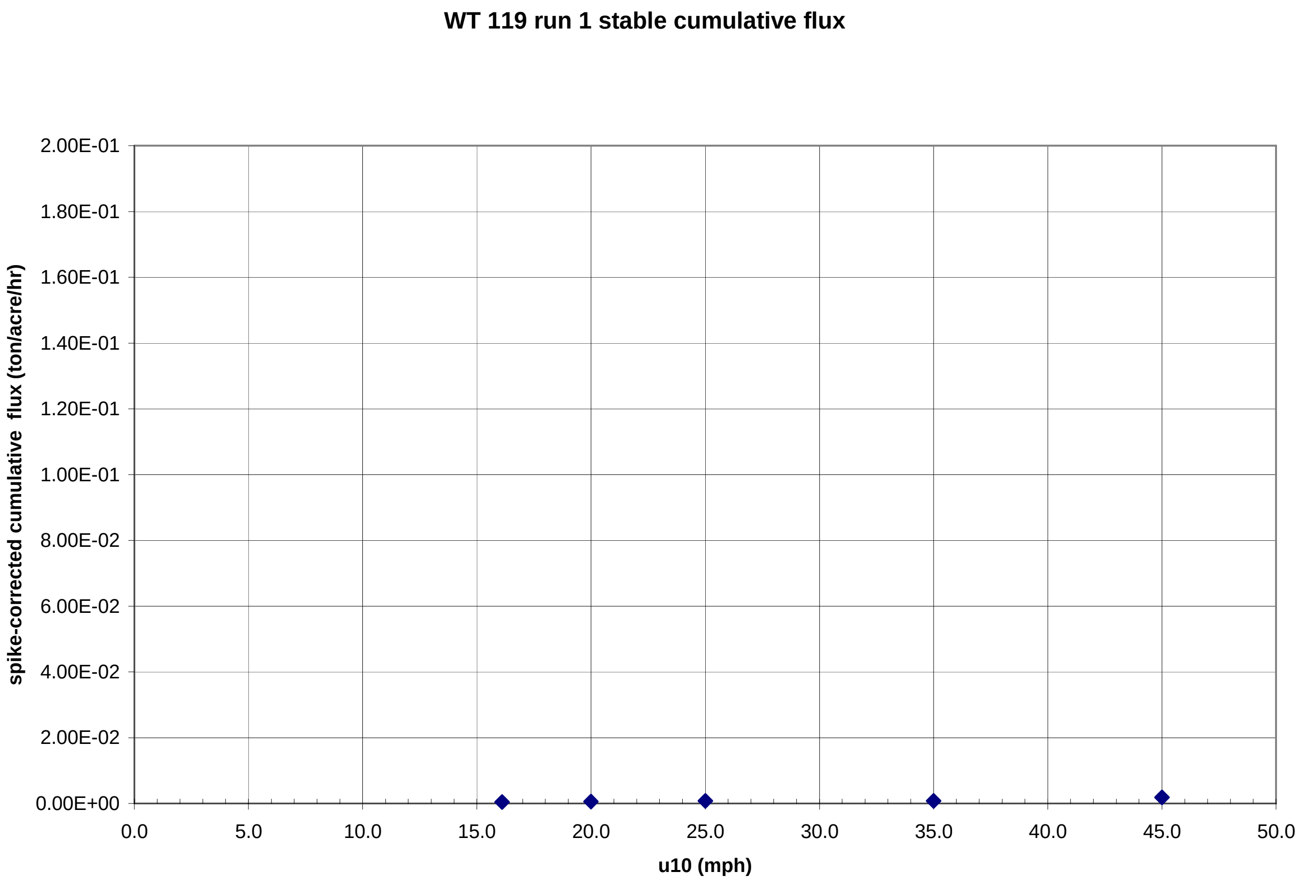
Appendix C (continued)

Figure 52 – U10 versus spike corrected flux – WT 118 3U



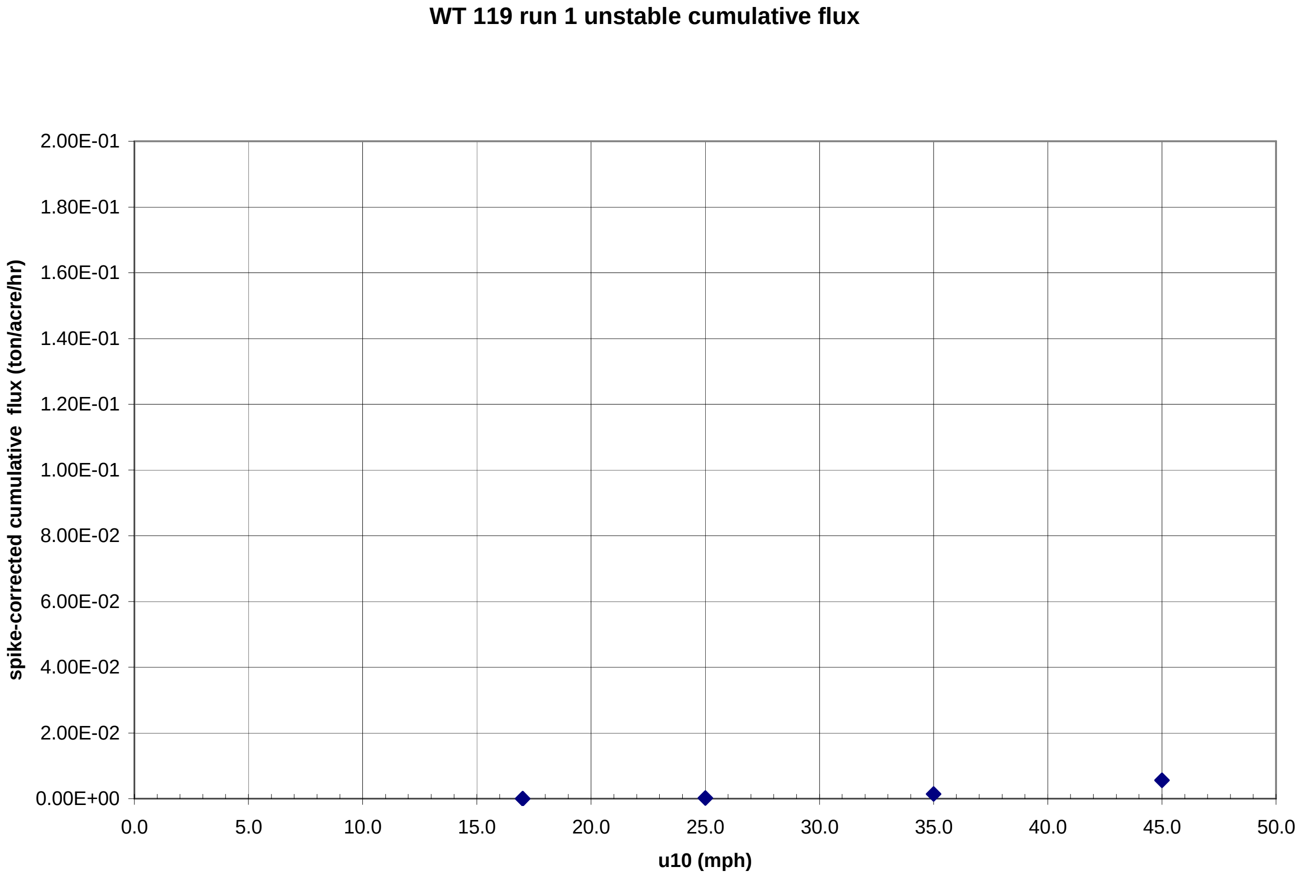
Appendix C (continued)

Figure 53 – U10 versus spike corrected flux – WT 119 1S



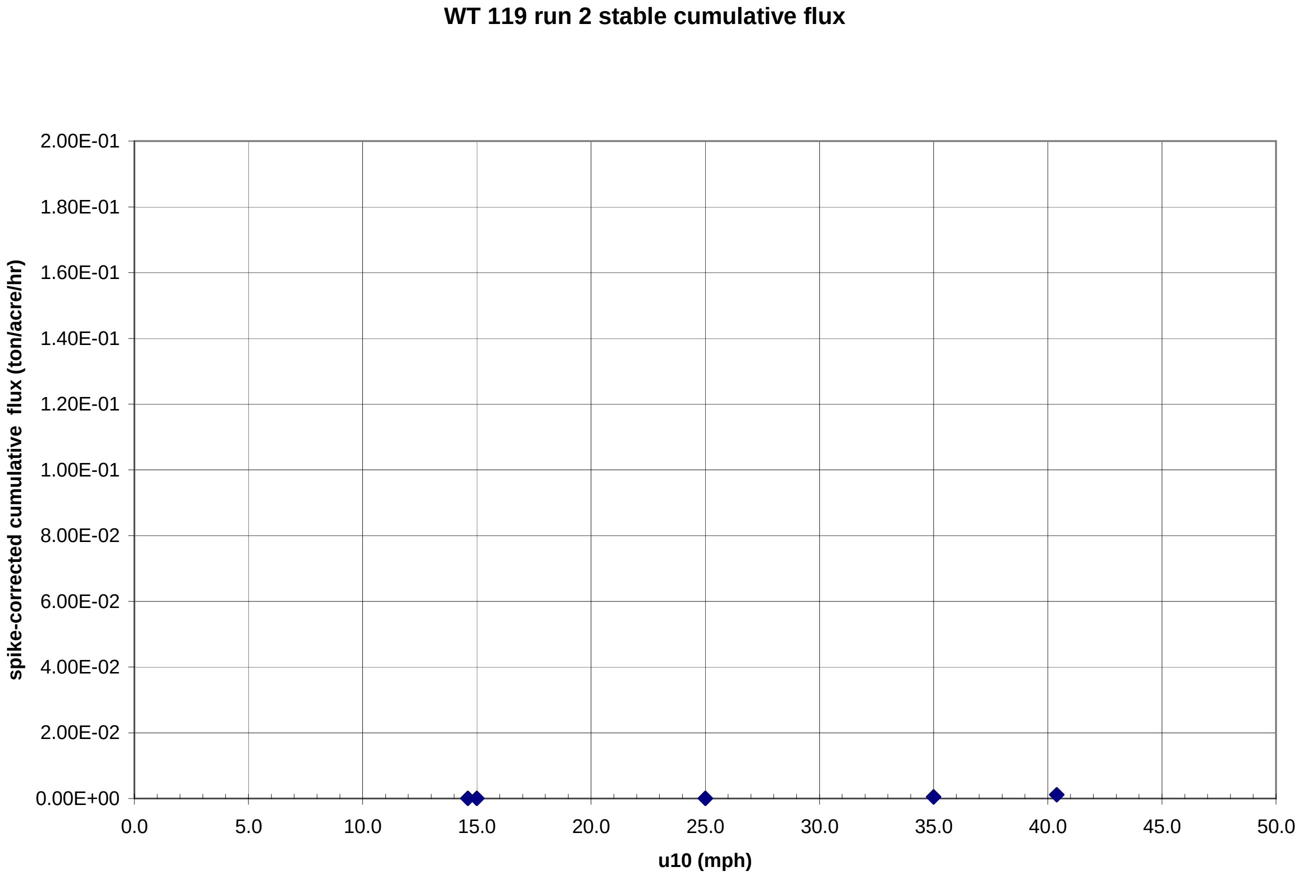
Appendix C (continued)

Figure 54 – U10 versus spike corrected flux – WT 119 1U



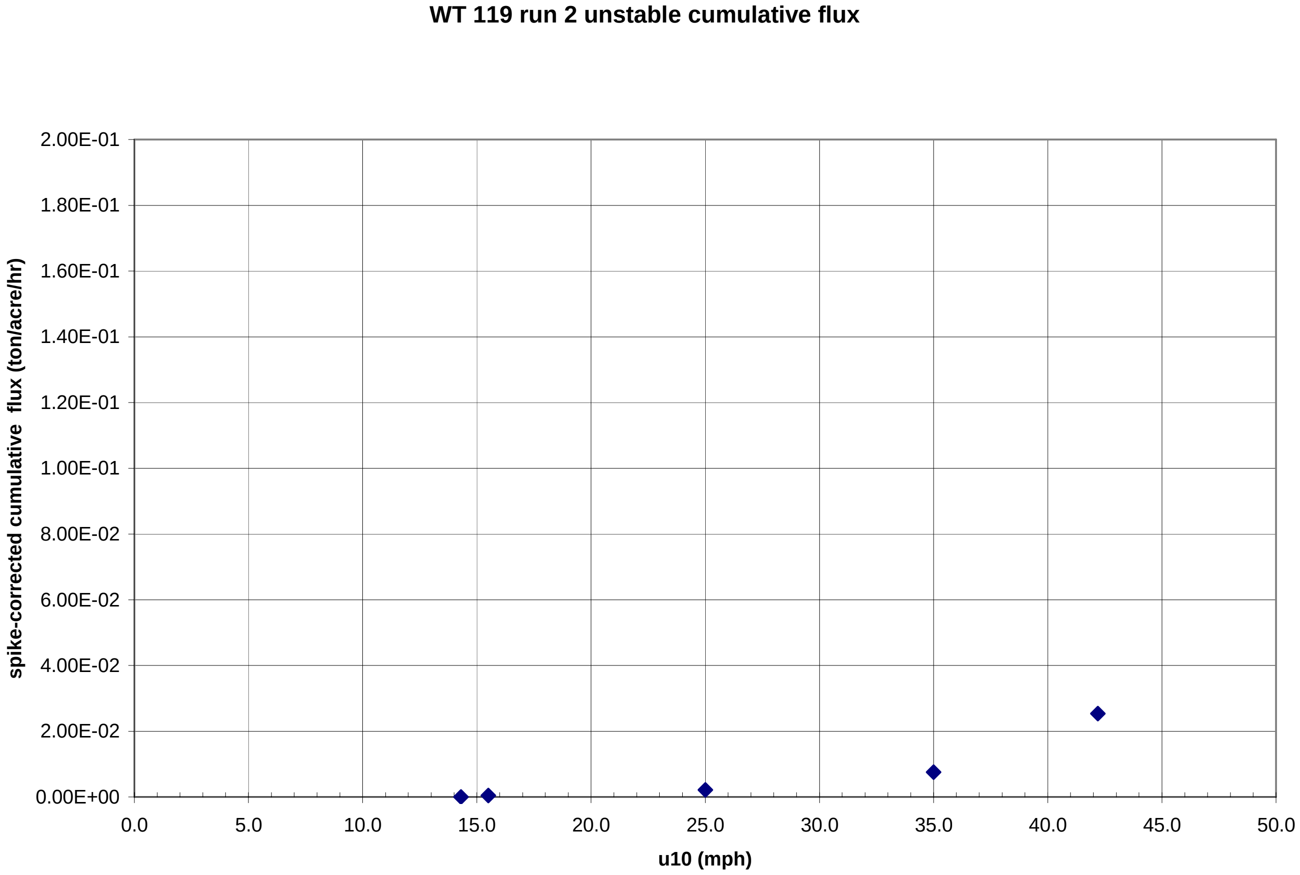
Appendix C (continued)

Figure 55 – U10 versus spike corrected flux – WT 119 2S



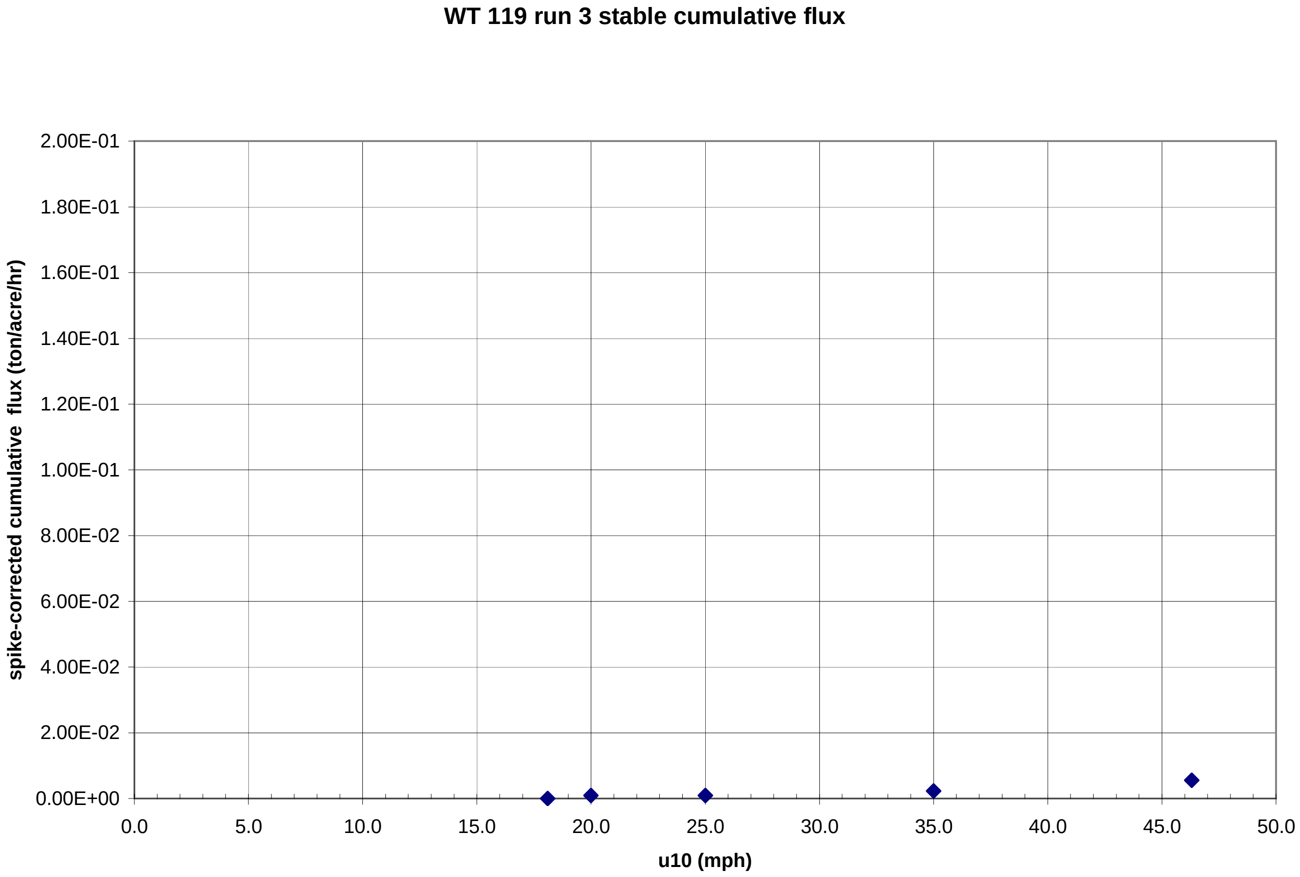
Appendix C (continued)

Figure 56 – U10 versus spike corrected flux – WT 119 2U



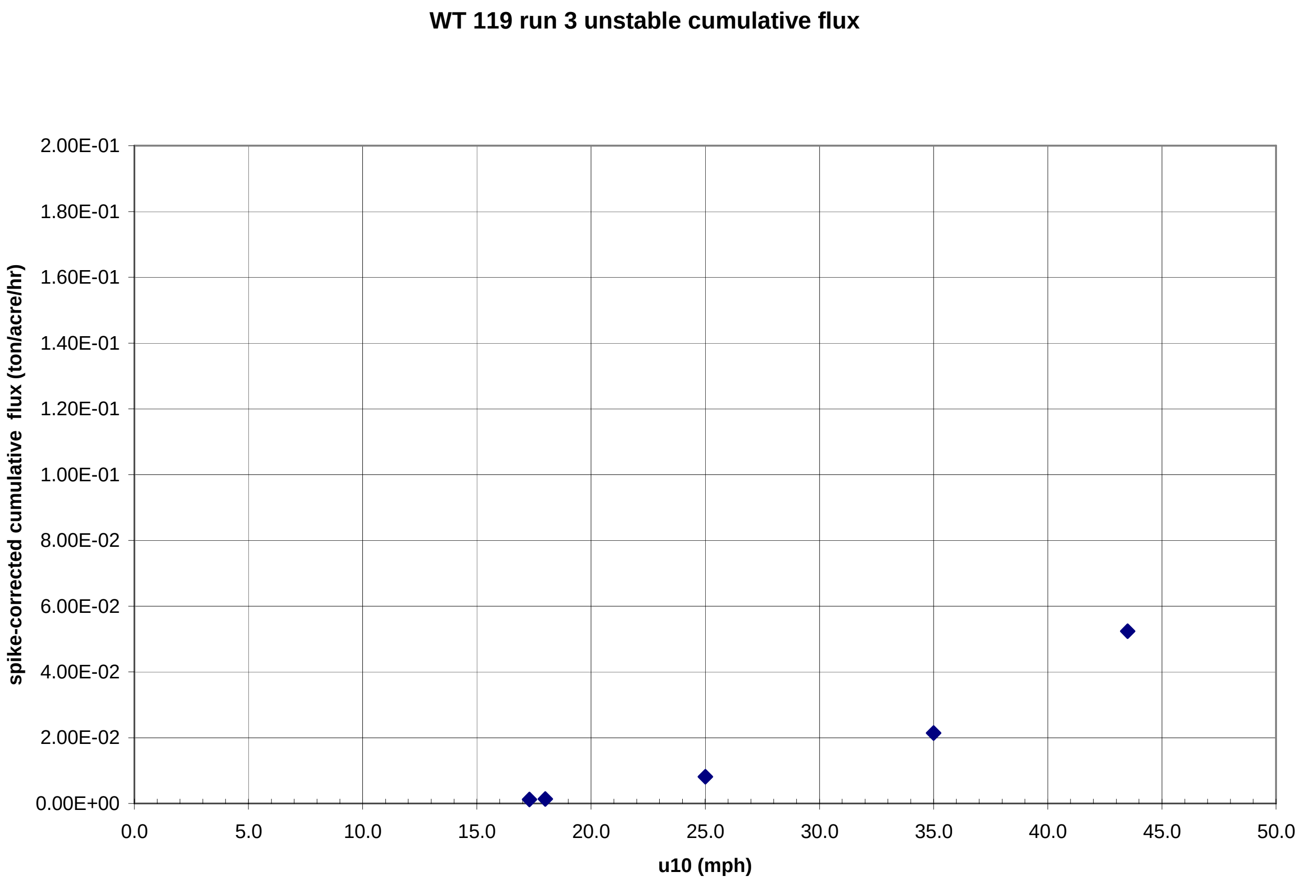
Appendix C (continued)

Figure 57 – U10 versus spike corrected flux – WT 119 3S



Appendix C (continued)

Figure 58 – U10 versus spike corrected flux – WT 119 3U



Appendix C (continued)

Figure 59 – U10 versus spike corrected flux – WT 121 1S

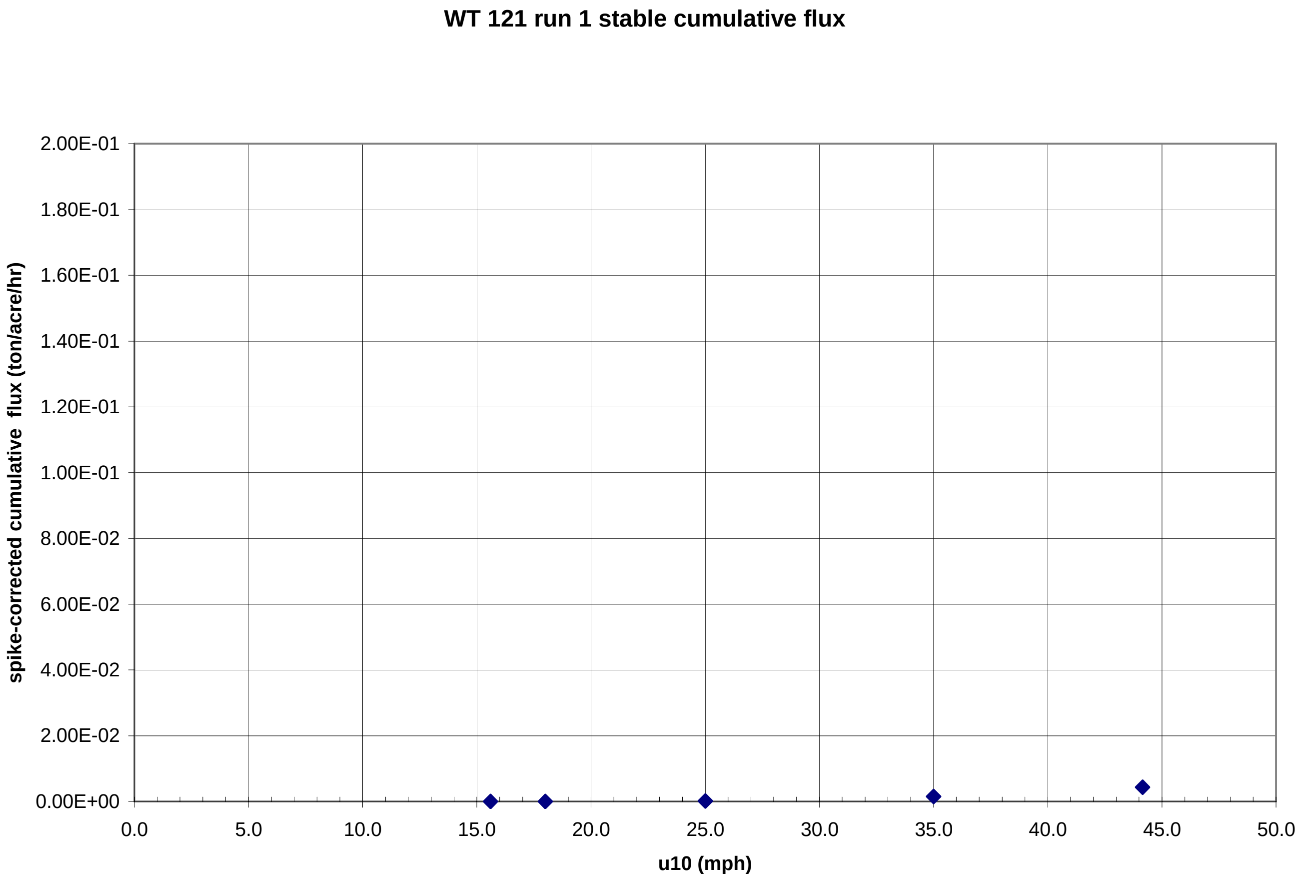
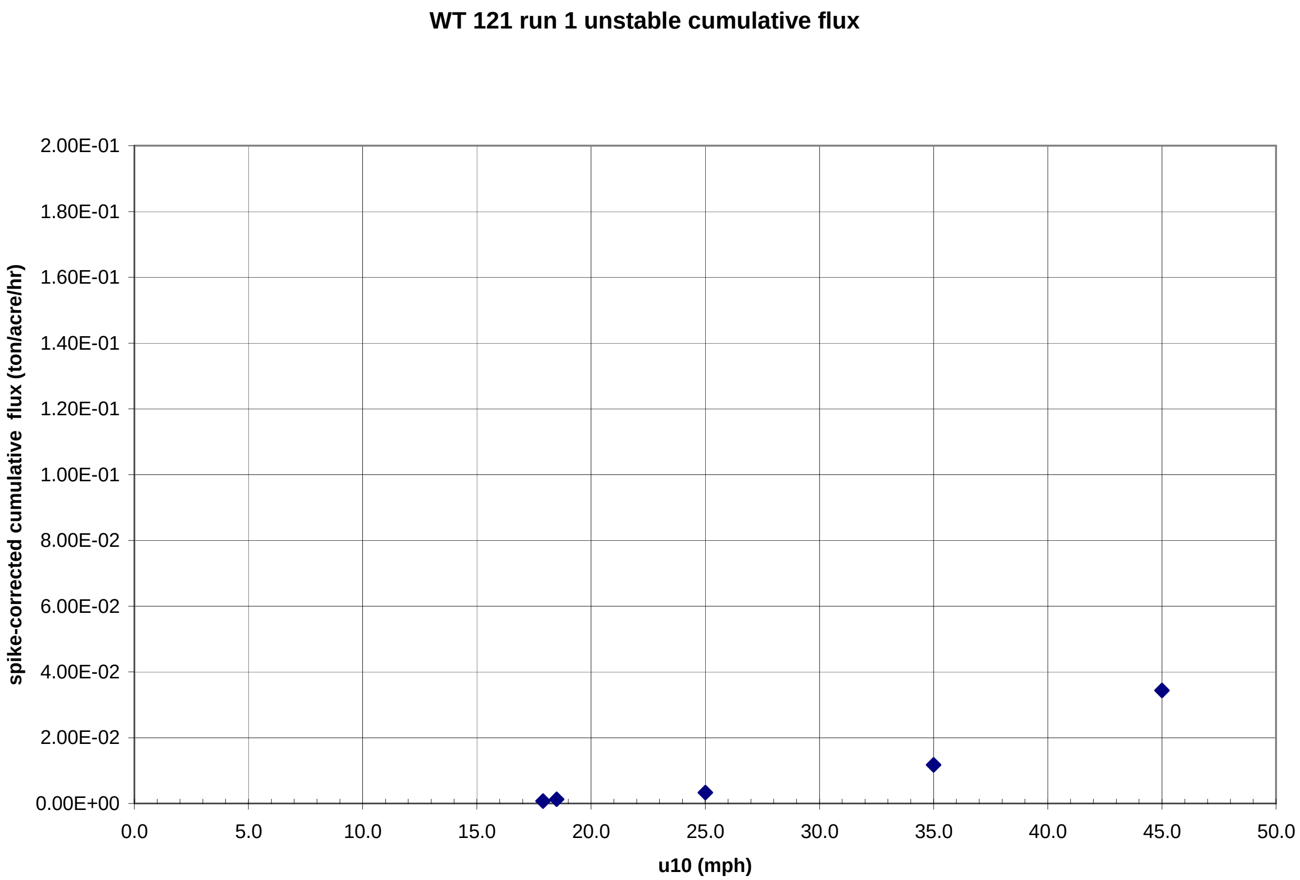
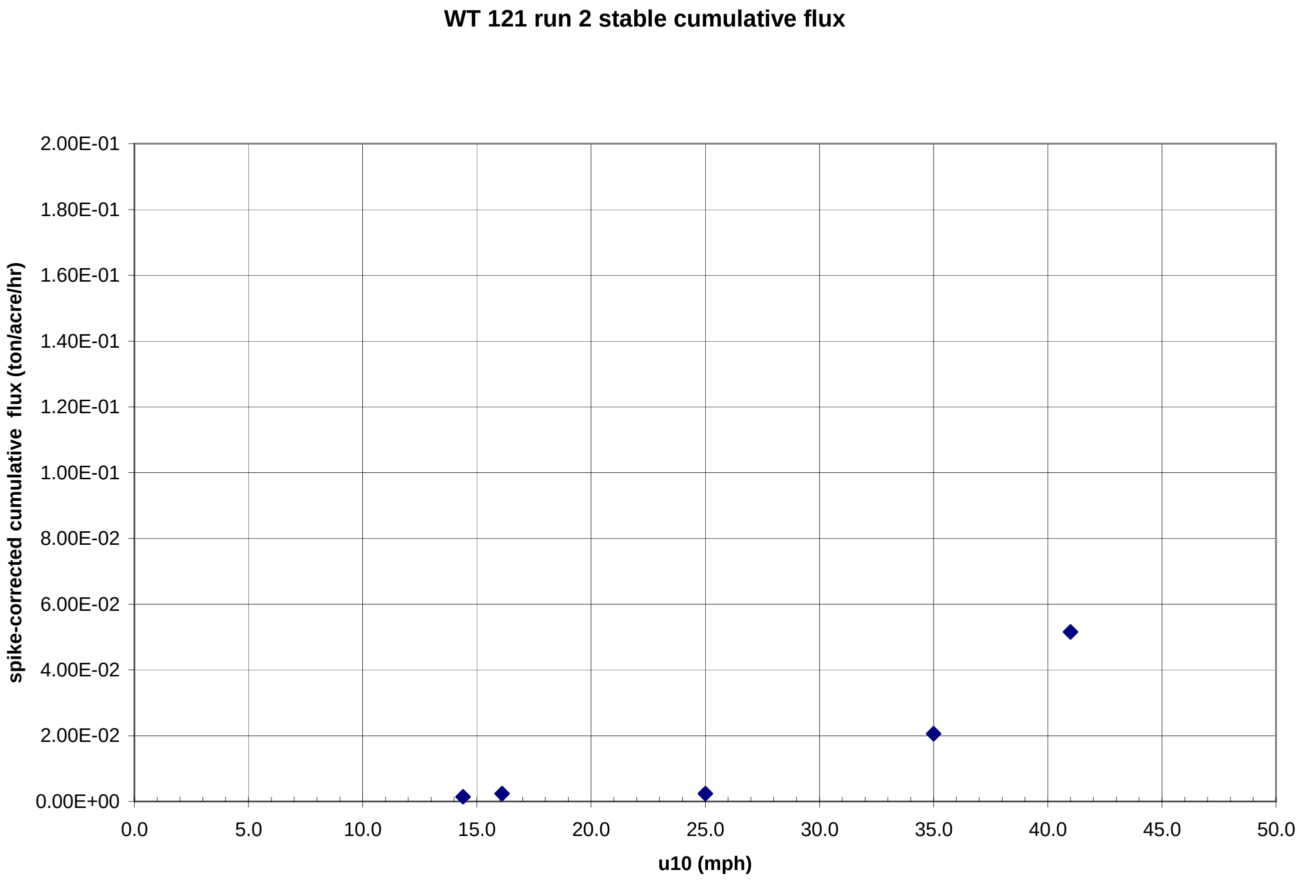


Figure 60 – U10 versus spike corrected flux – WT 121 1U



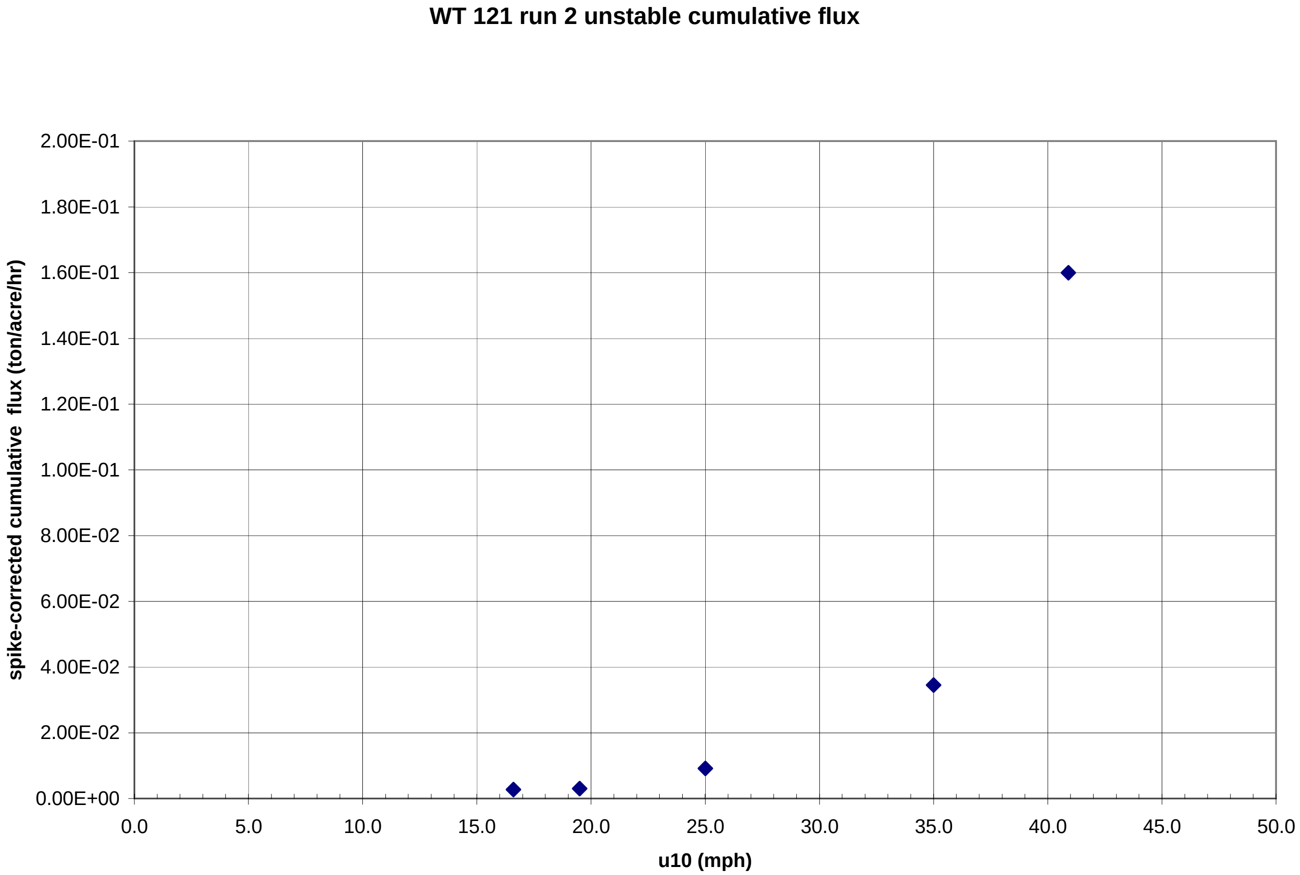
Appendix C (continued)

Figure 61 – U10 versus spike corrected flux – WT 121 2S



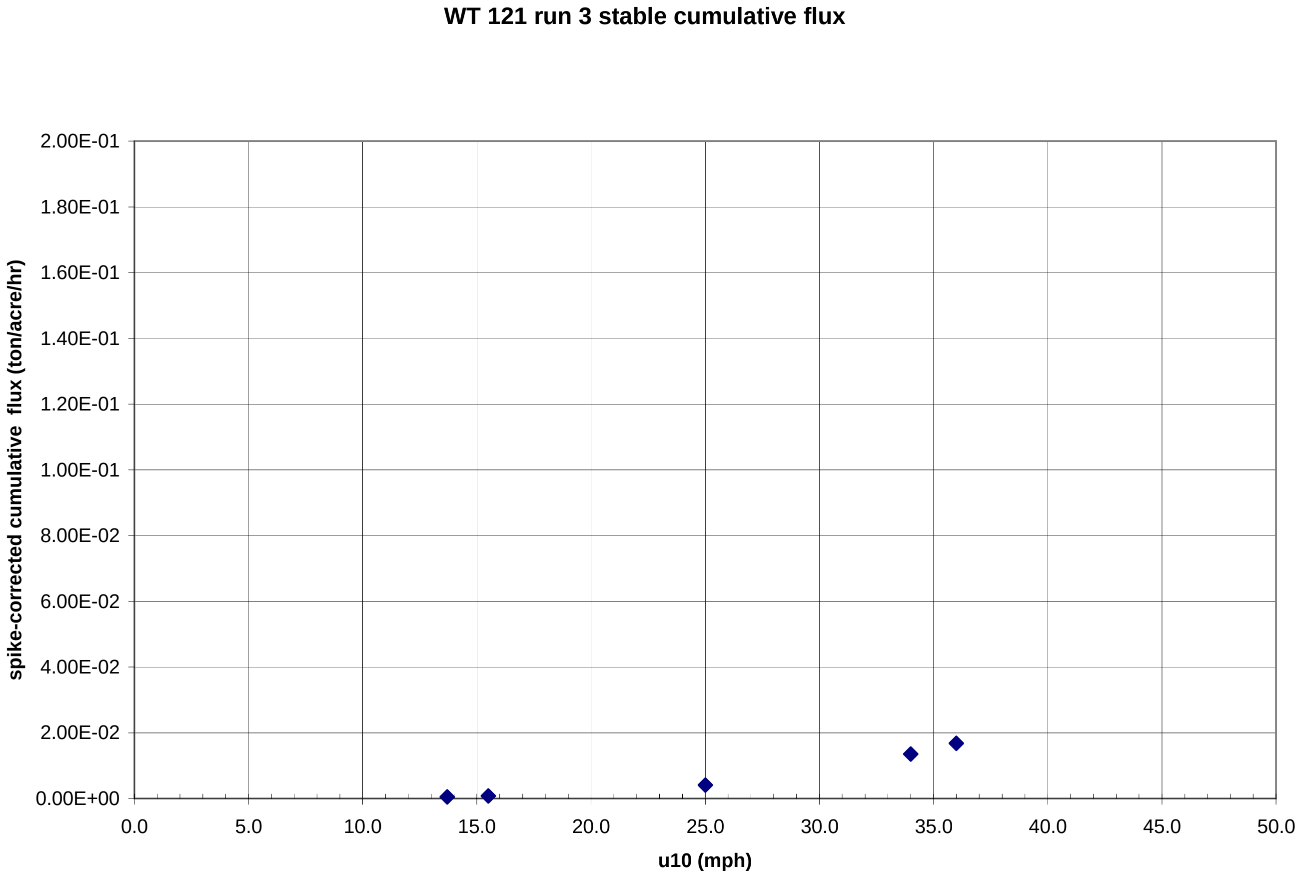
Appendix C (continued)

Figure 62 – U10 versus spike corrected flux – WT 121 2U



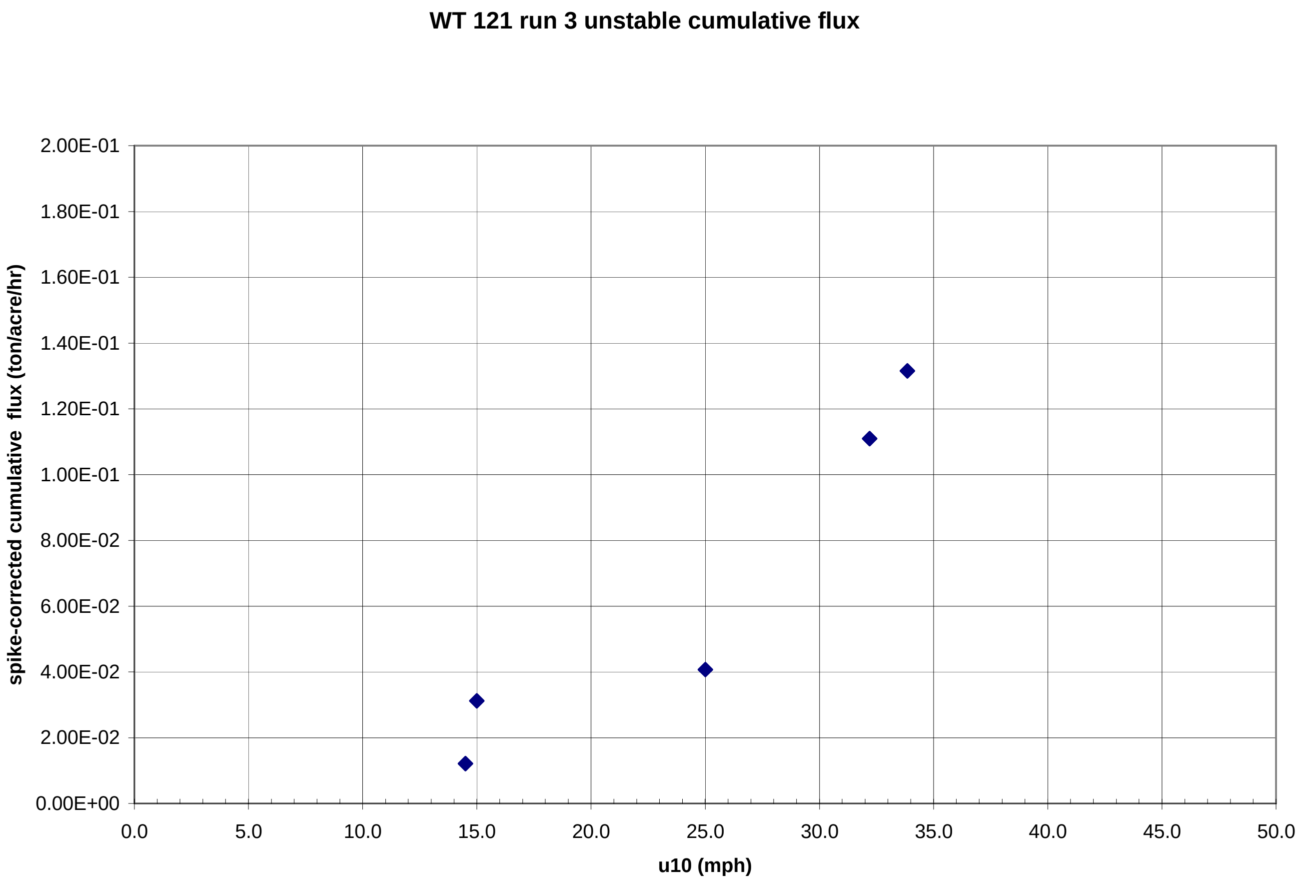
Appendix C (continued)

Figure 63 – U10 versus spike corrected flux – WT 121 3S



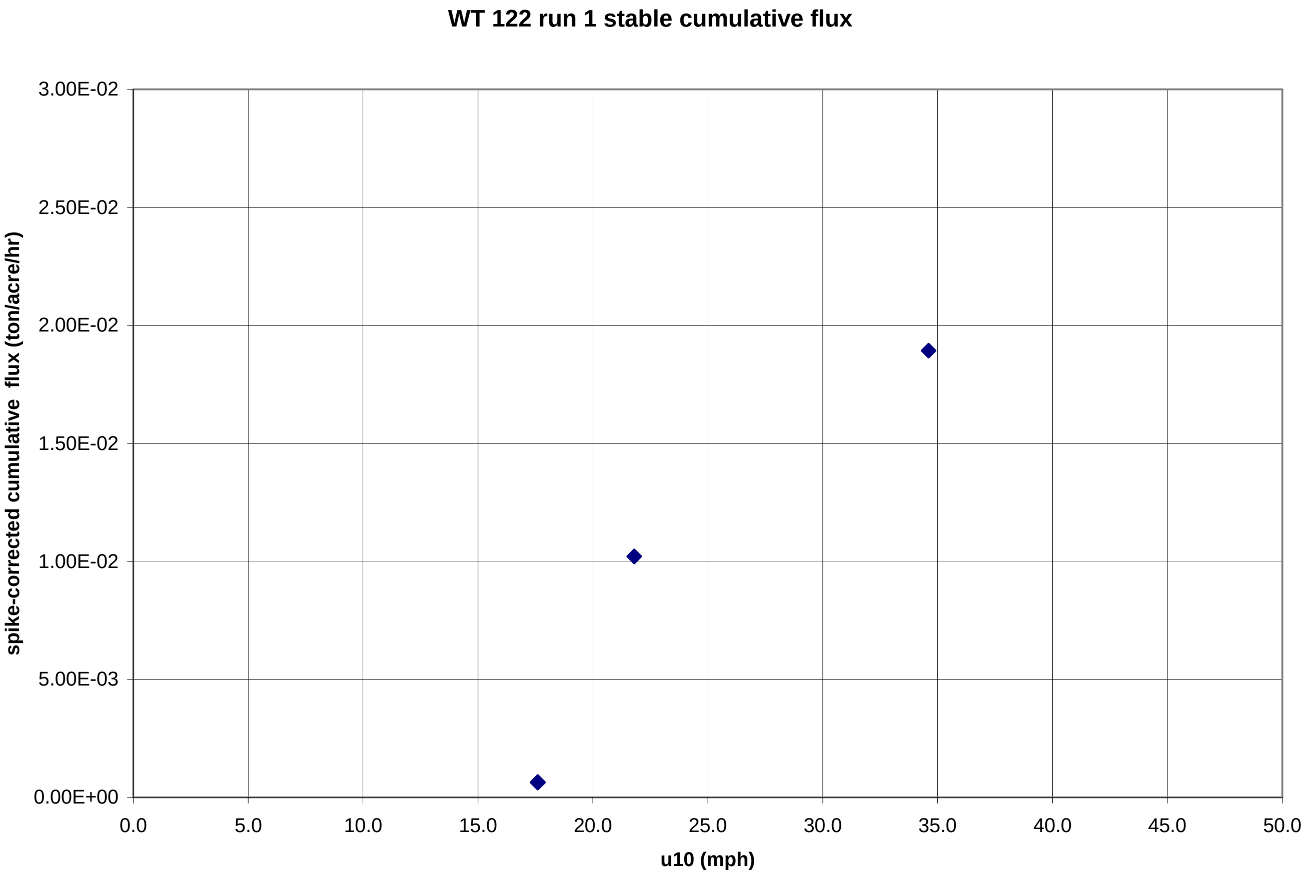
Appendix C (continued)

Figure 64 – U10 versus spike corrected flux – WT 121 3U



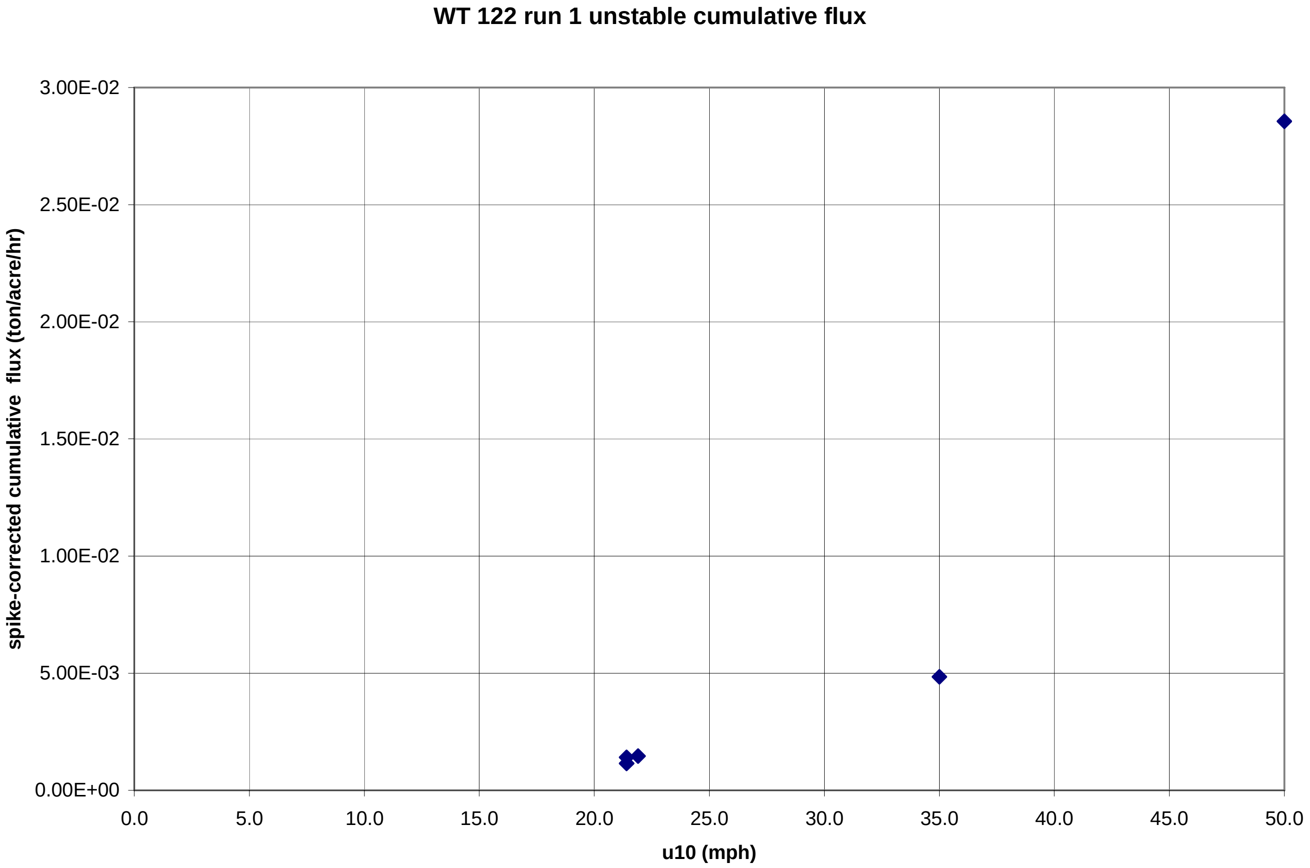
Appendix C (continued)

Figure 65 – U10 versus spike corrected flux – WT 122 1S



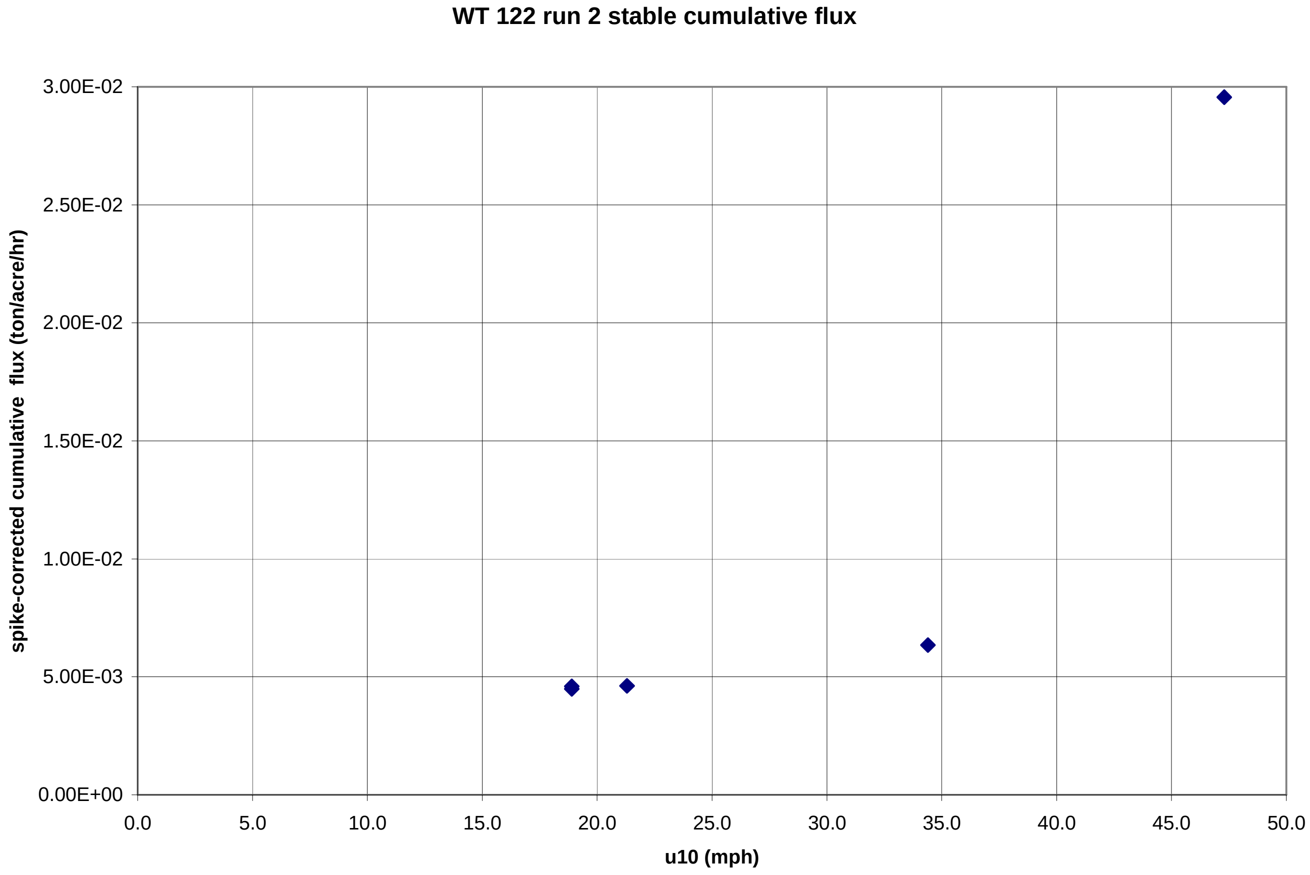
Appendix C (continued)

Figure 66 – U10 versus spike corrected flux – WT 122 1U



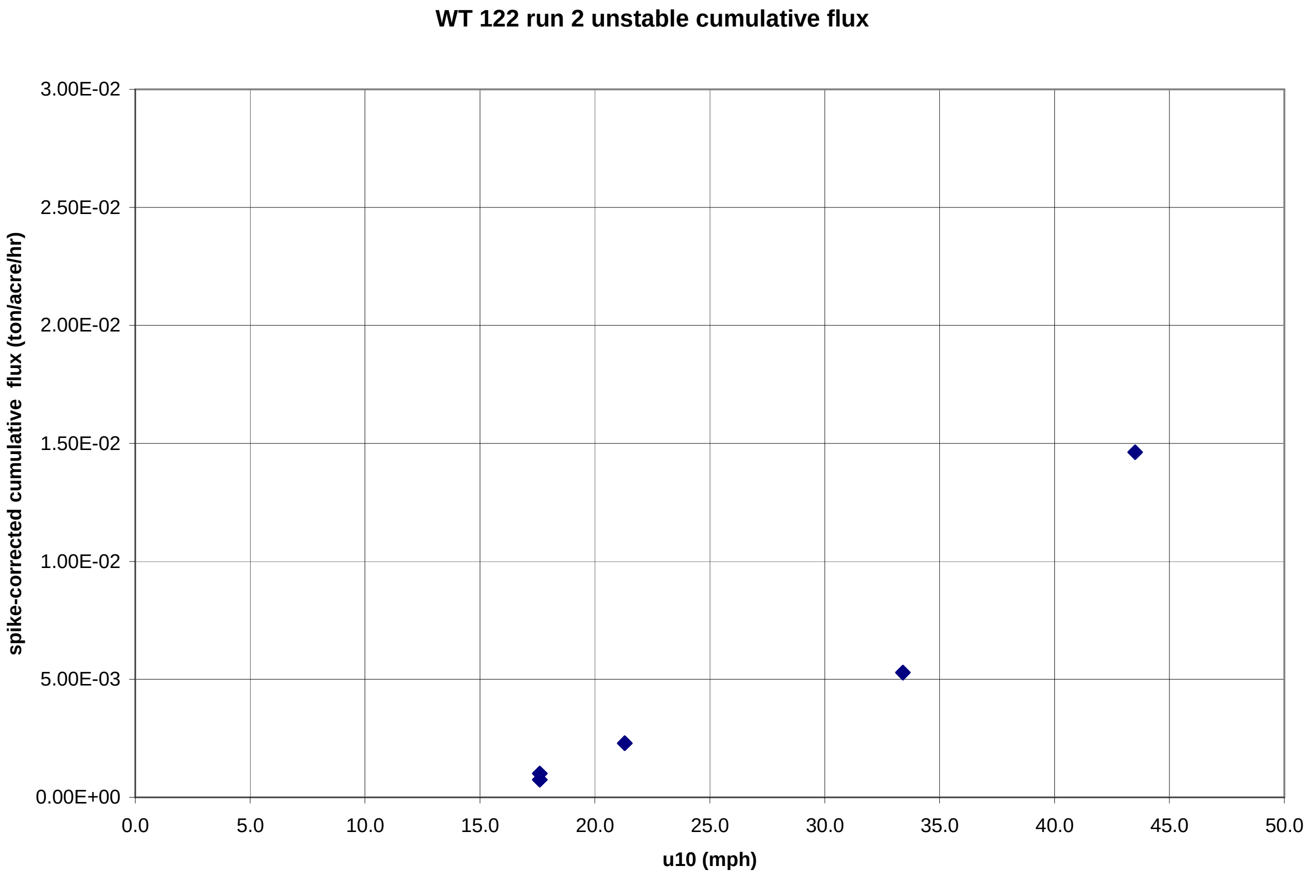
Appendix C (continued)

Figure 67 – U10 versus spike corrected flux – WT 122 2S



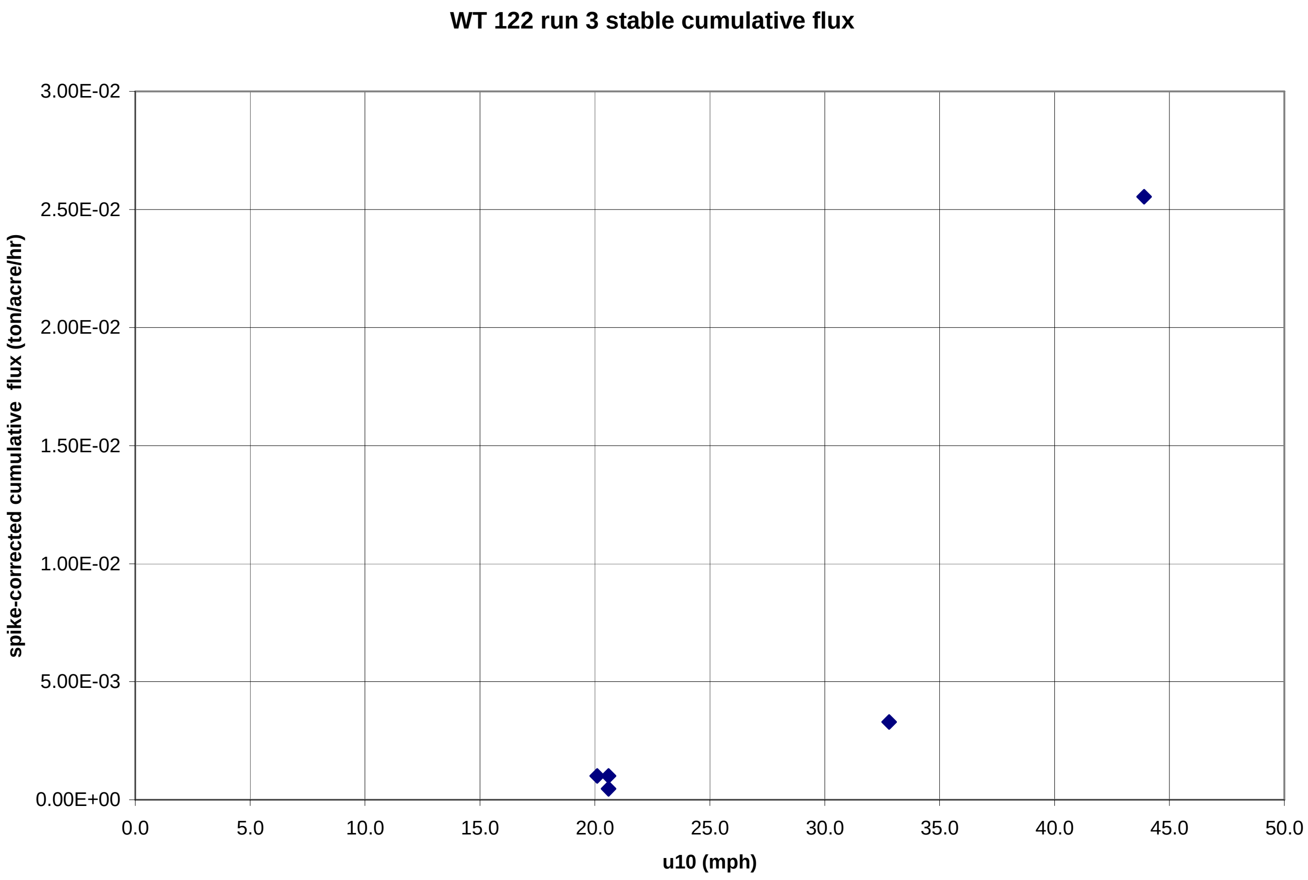
Appendix C (continued)

Figure 68 – U10 versus spike corrected flux – WT 122 2U



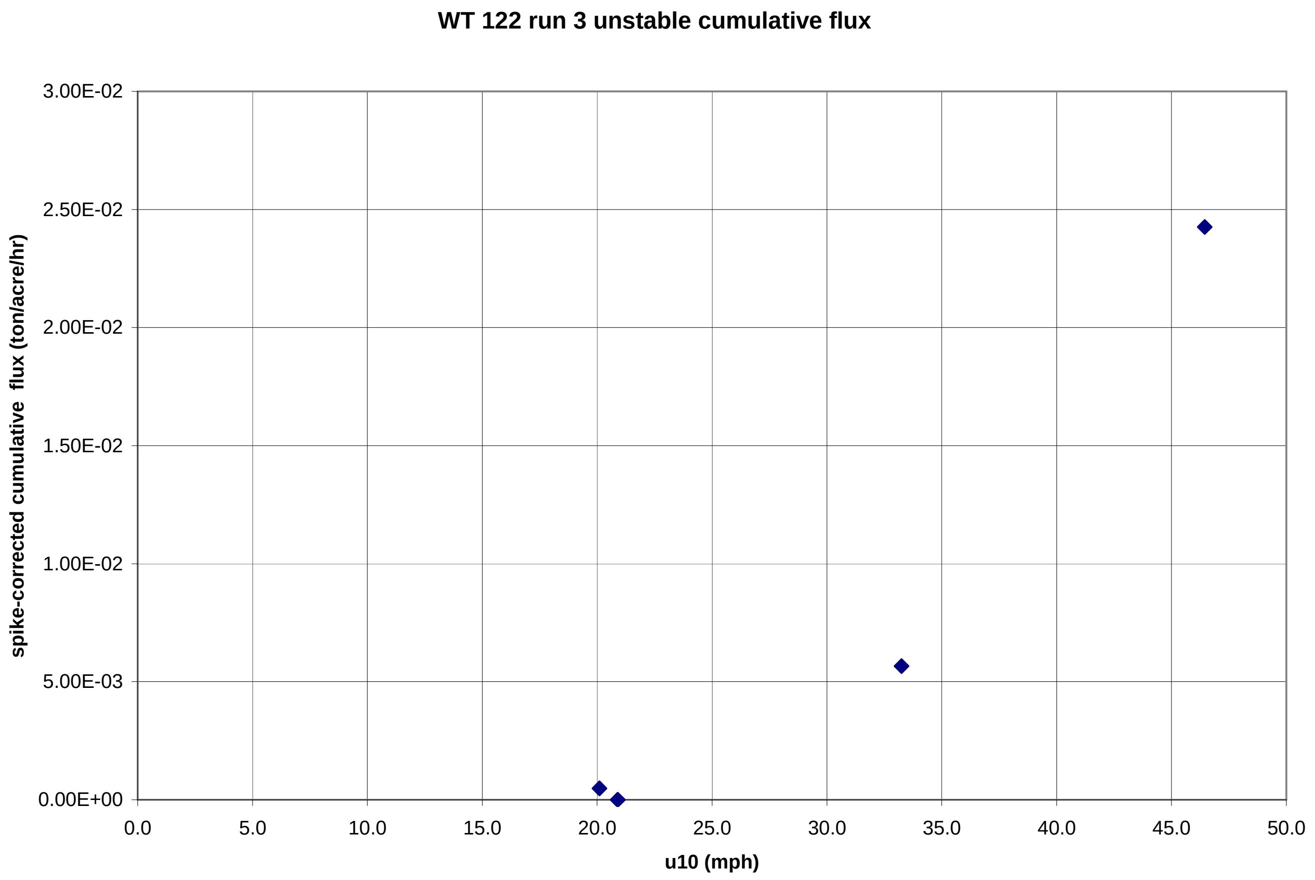
Appendix C (continued)

Figure 69 – U10 versus spike corrected flux – WT 122 3S



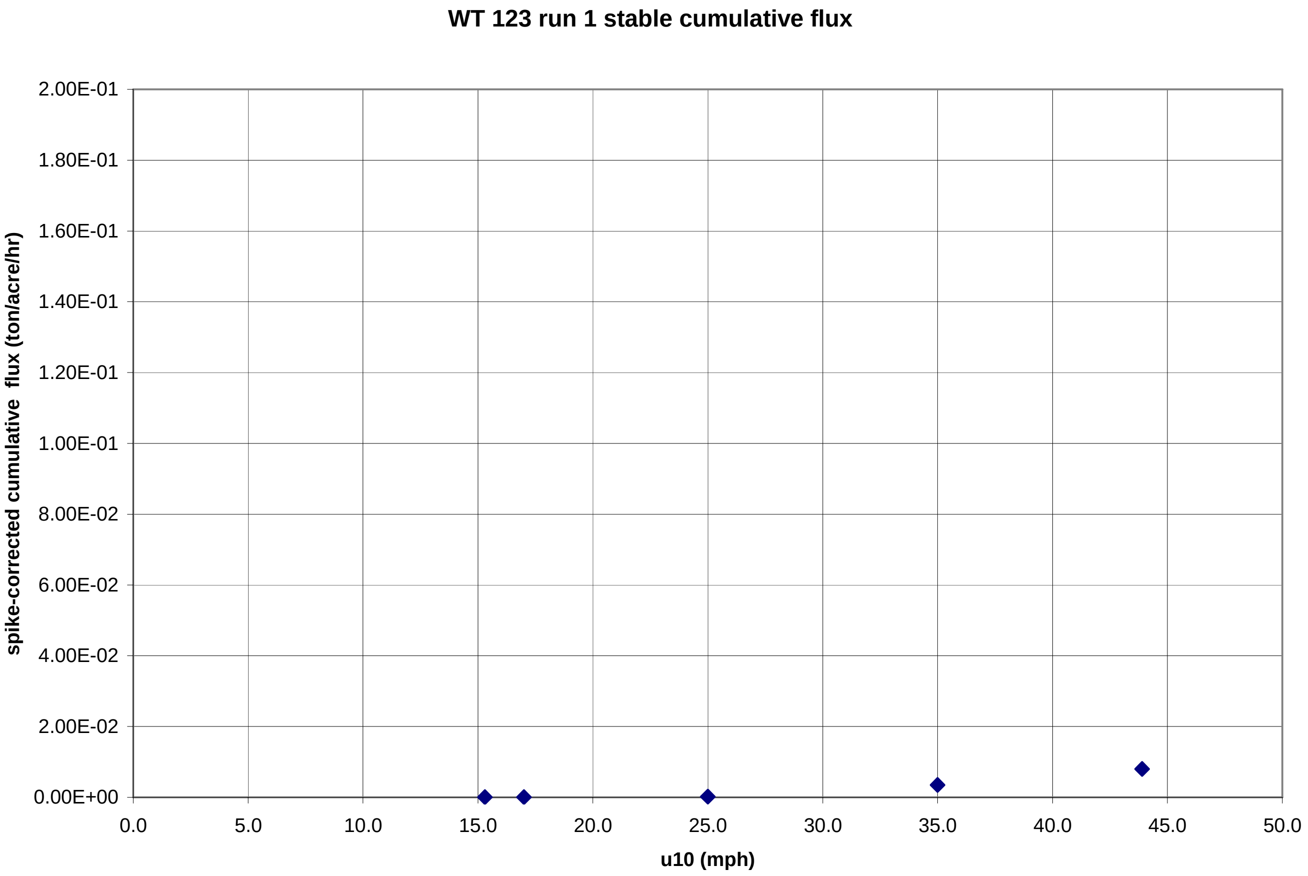
Appendix C (continued)

Figure 70 – U10 versus spike corrected flux – WT 122 3U



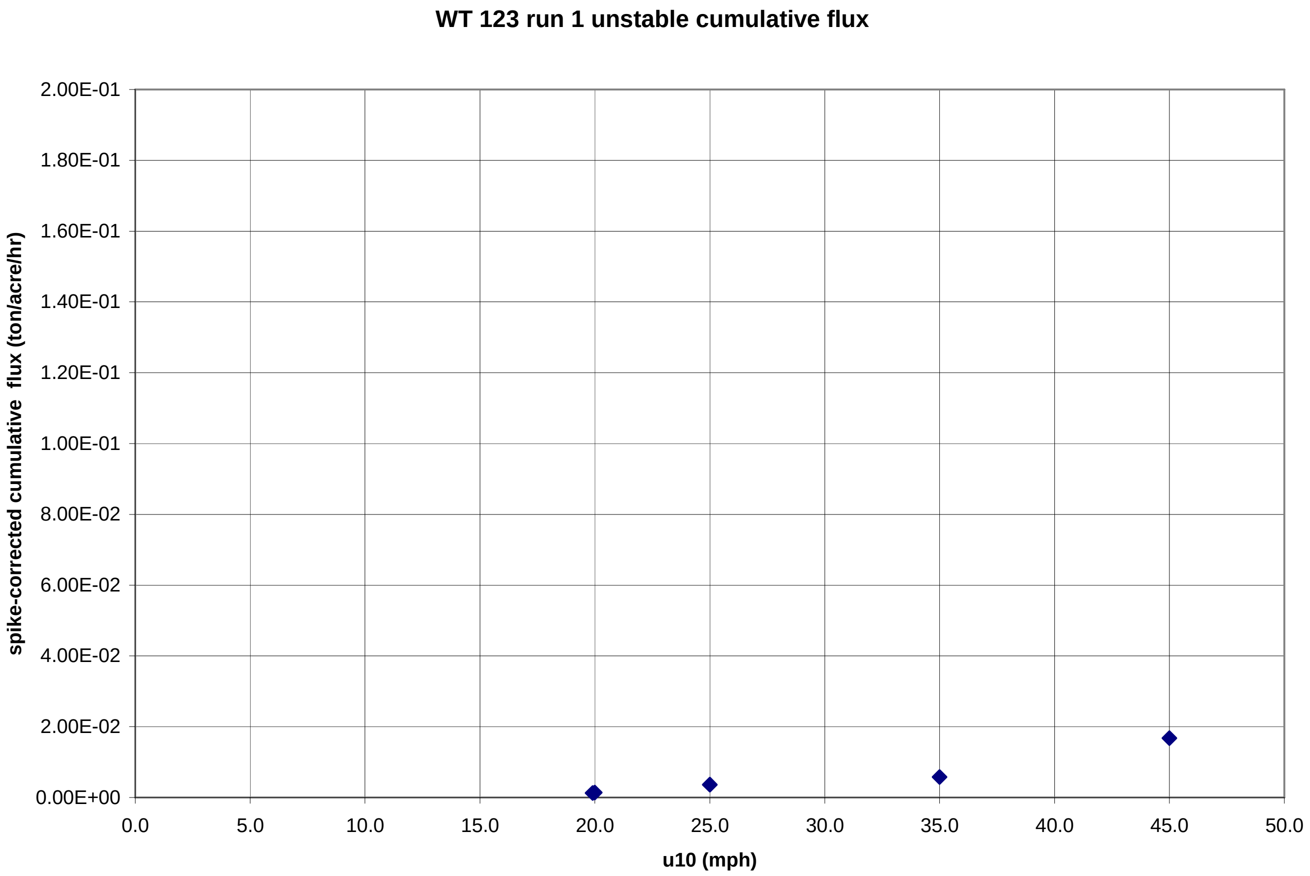
Appendix C (continued)

Figure 71 – U10 versus spike corrected flux – WT 123 1S



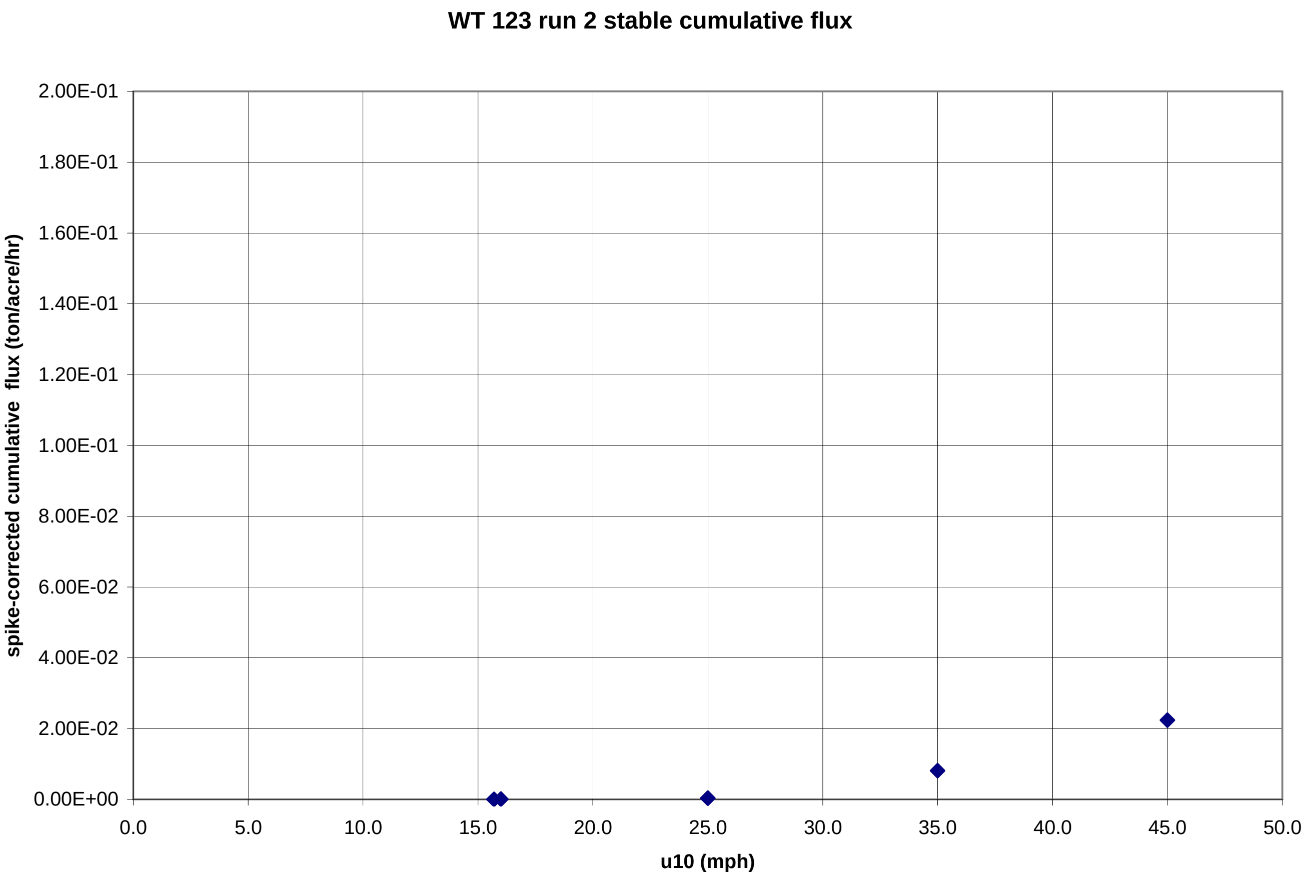
Appendix C (continued)

Figure 72 – U10 versus spike corrected flux – WT 123 1U



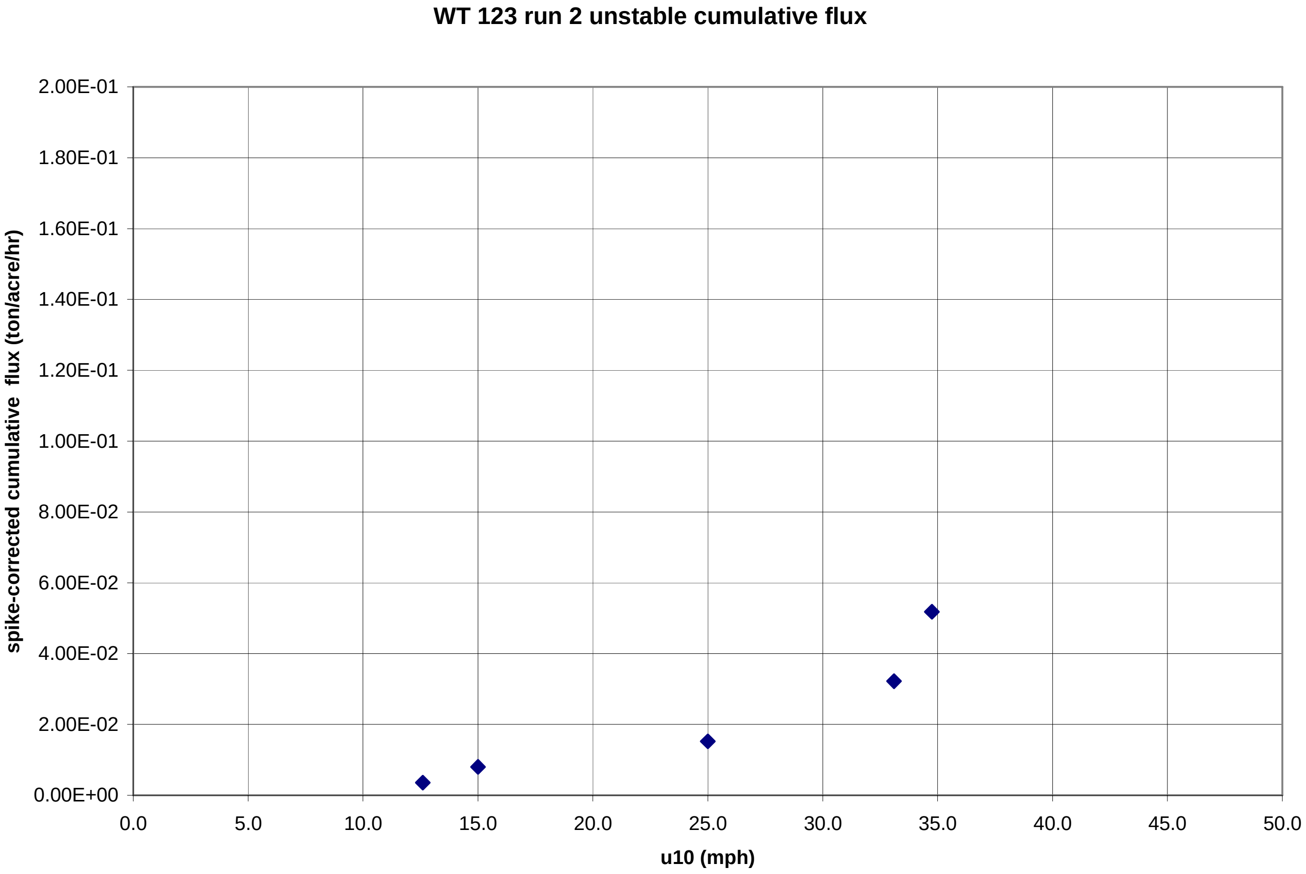
Appendix C (continued)

Figure 73 – U10 versus spike corrected flux – WT 123 2S



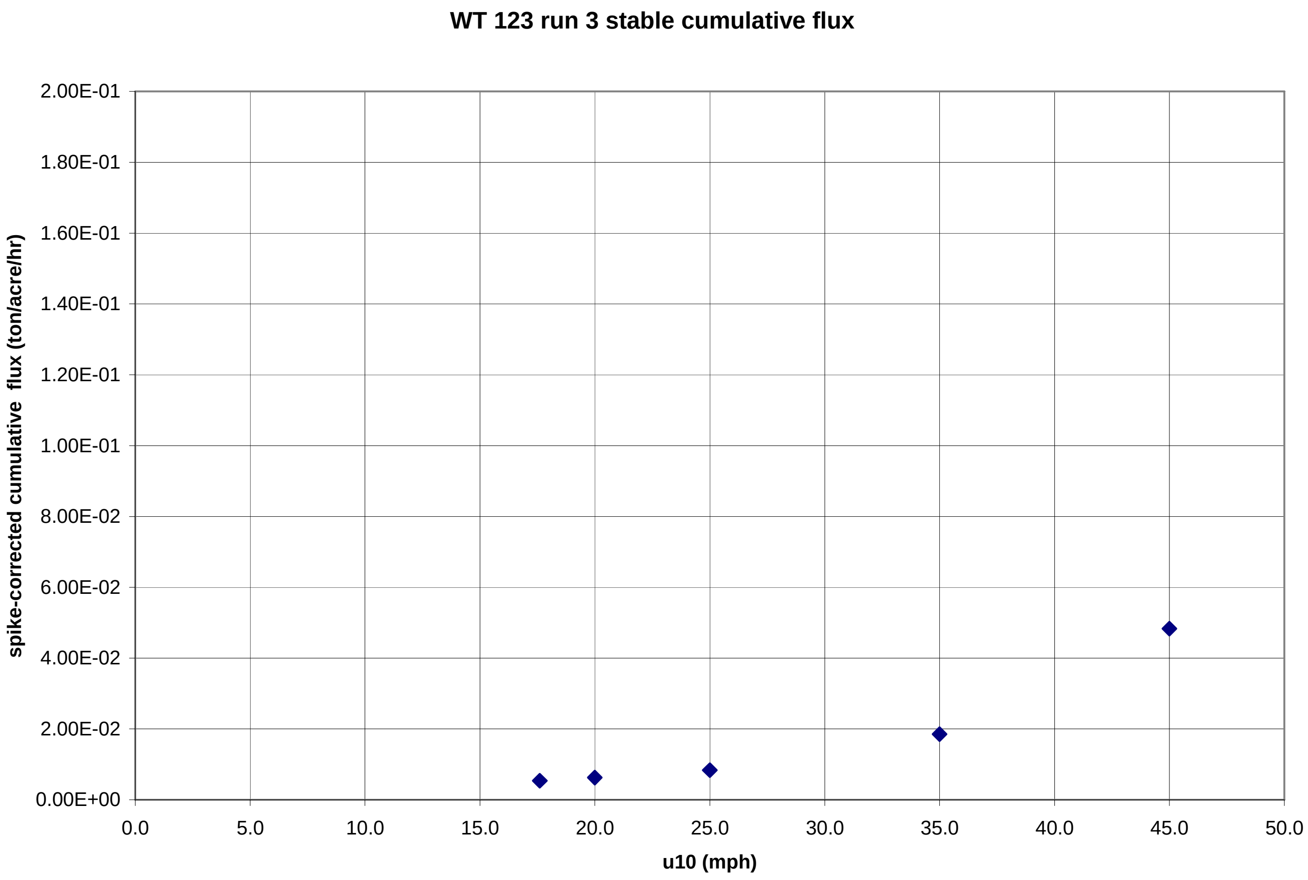
Appendix C (continued)

Figure 74 – U10 versus spike corrected flux – WT 123 2U



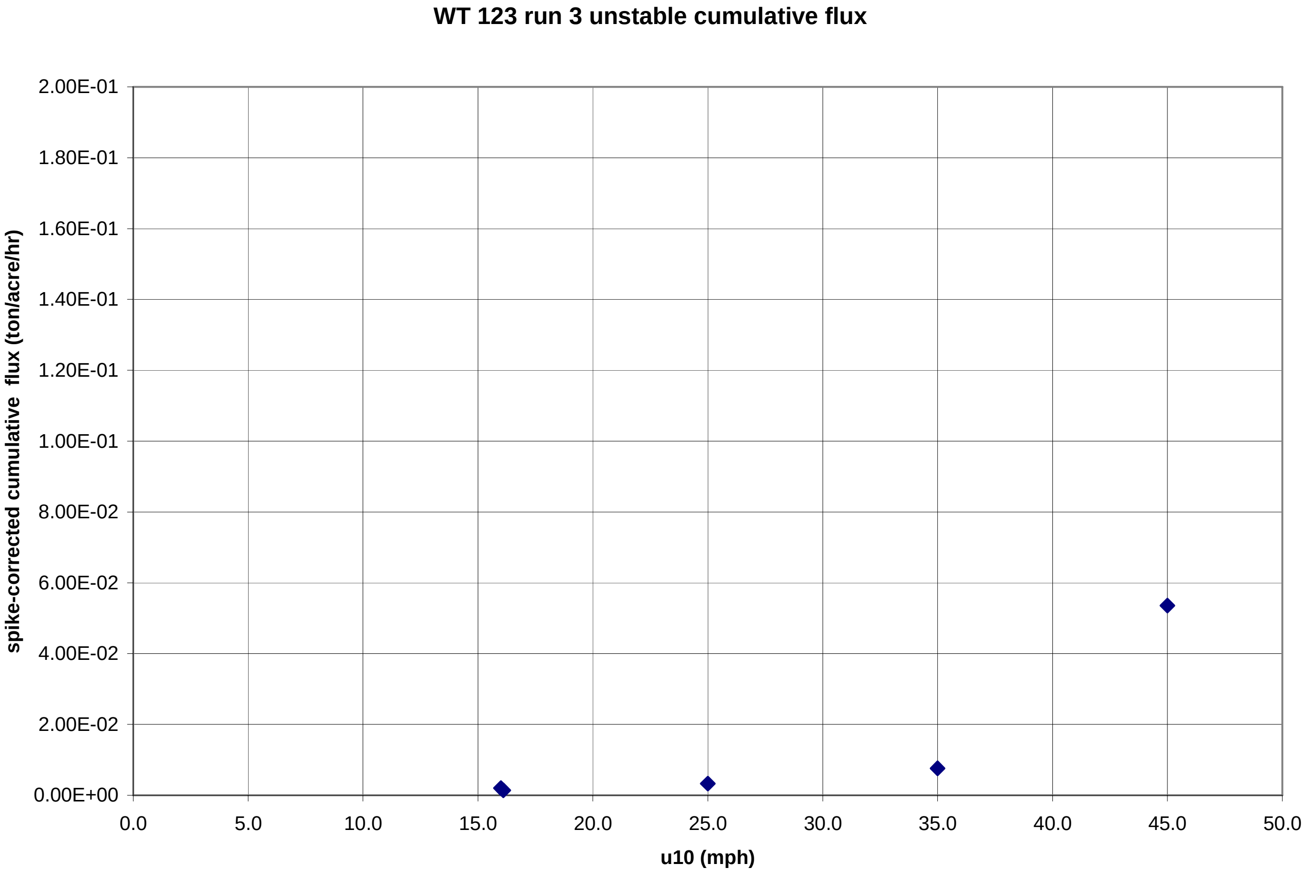
Appendix C (continued)

Figure 75 – U10 versus spike corrected flux – WT 123 3S



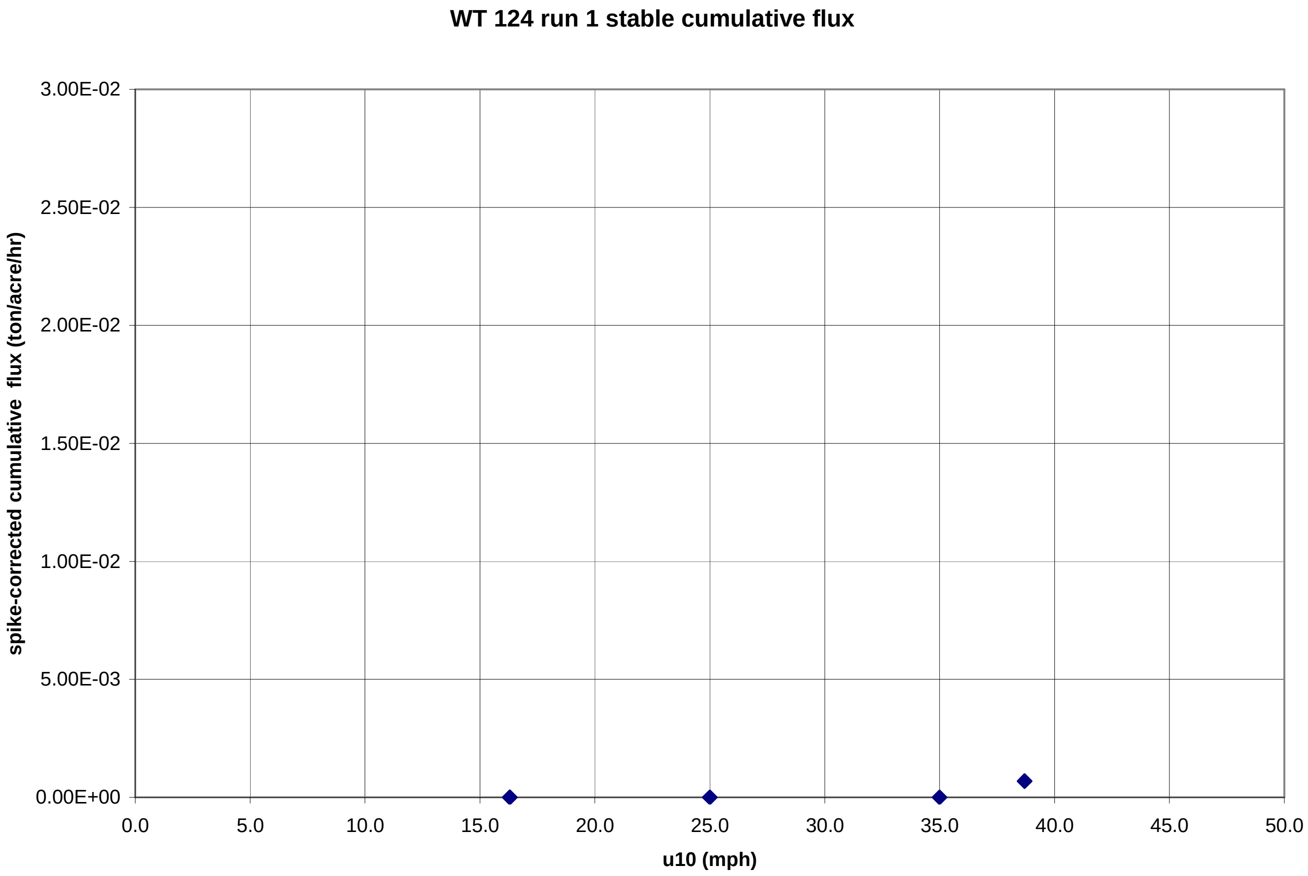
Appendix C (continued)

Figure 76 – U10 versus spike corrected flux – WT 123 3U



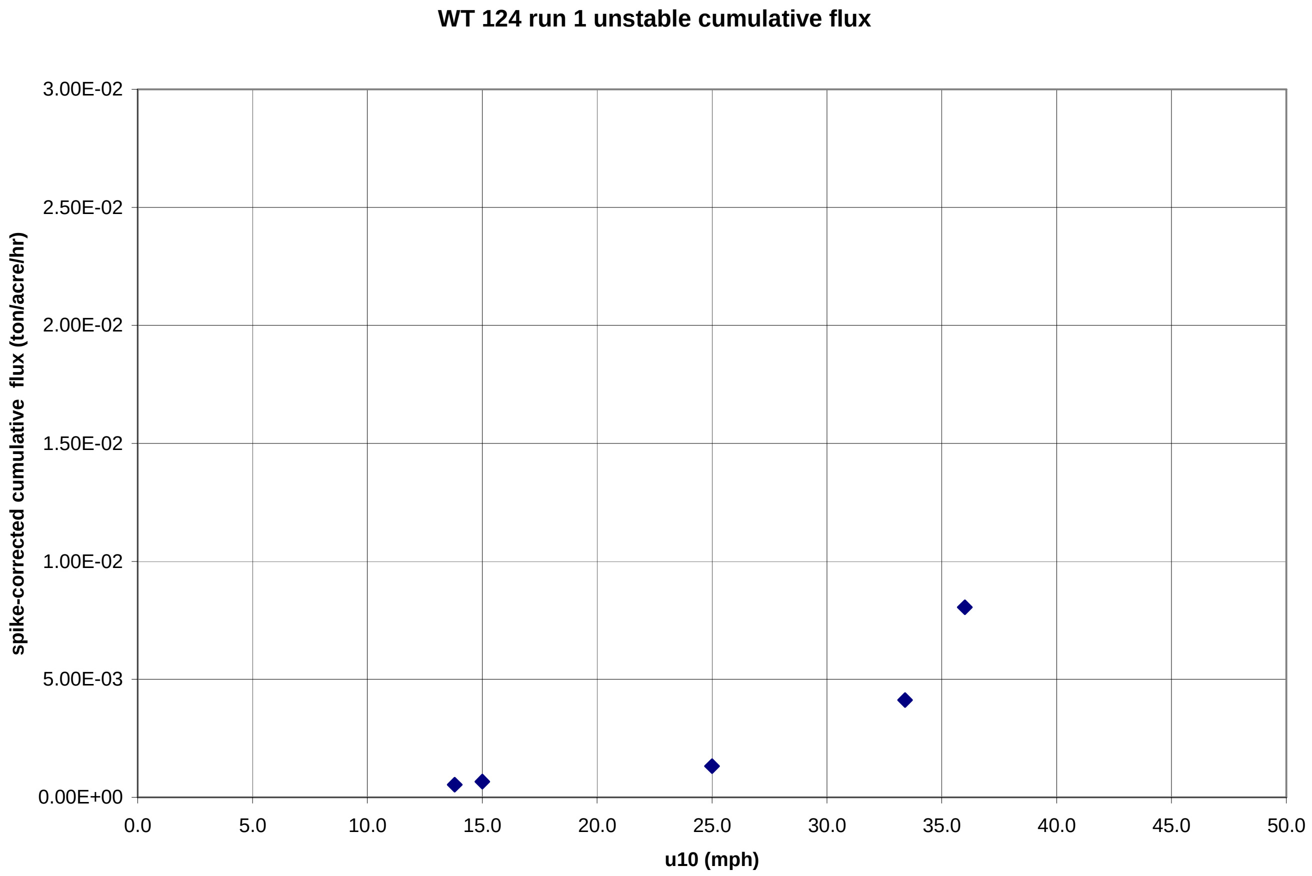
Appendix C (continued)

Figure 77 – U10 versus spike corrected flux – WT 124 1S



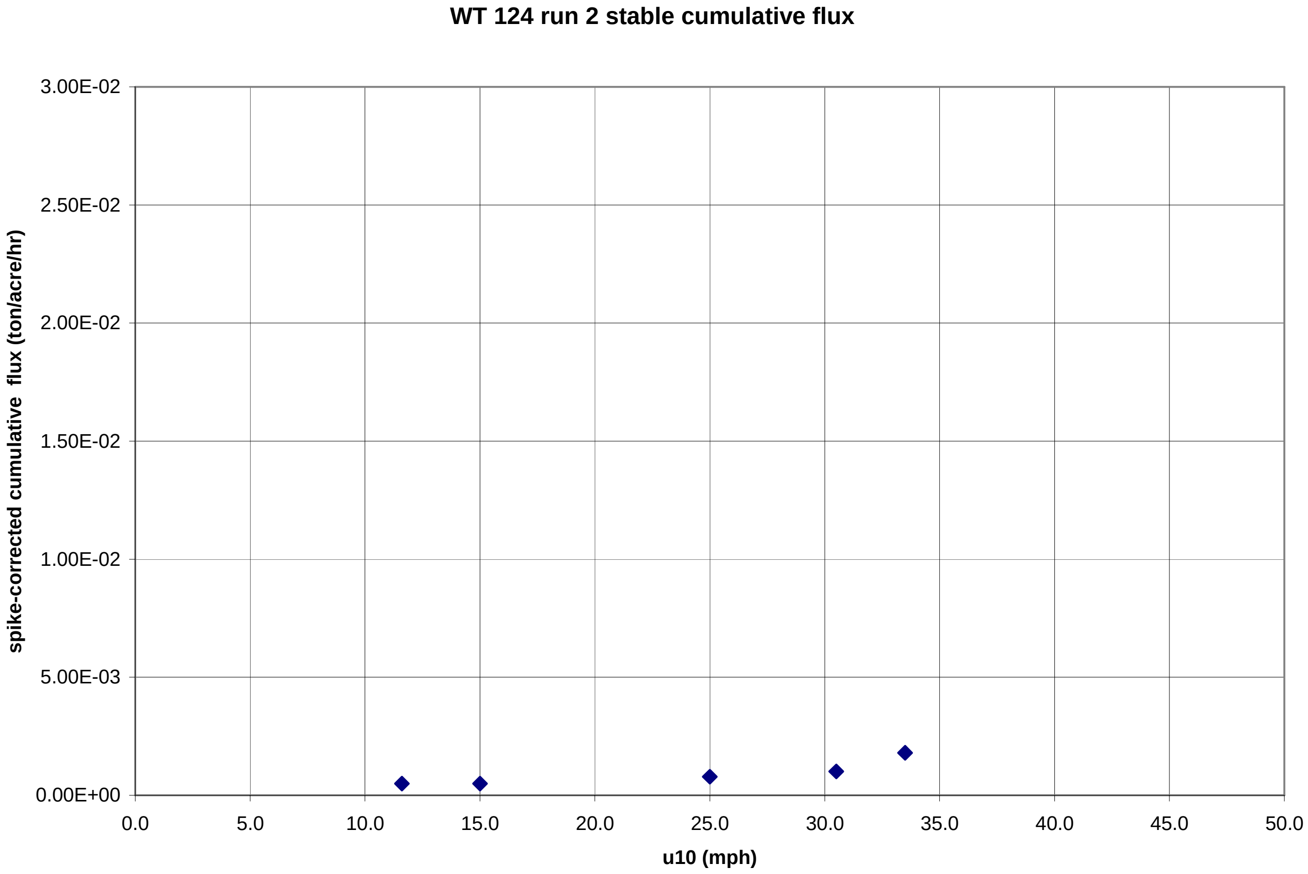
Appendix C (continued)

Figure 78 – U10 versus spike corrected flux – WT 124 1U



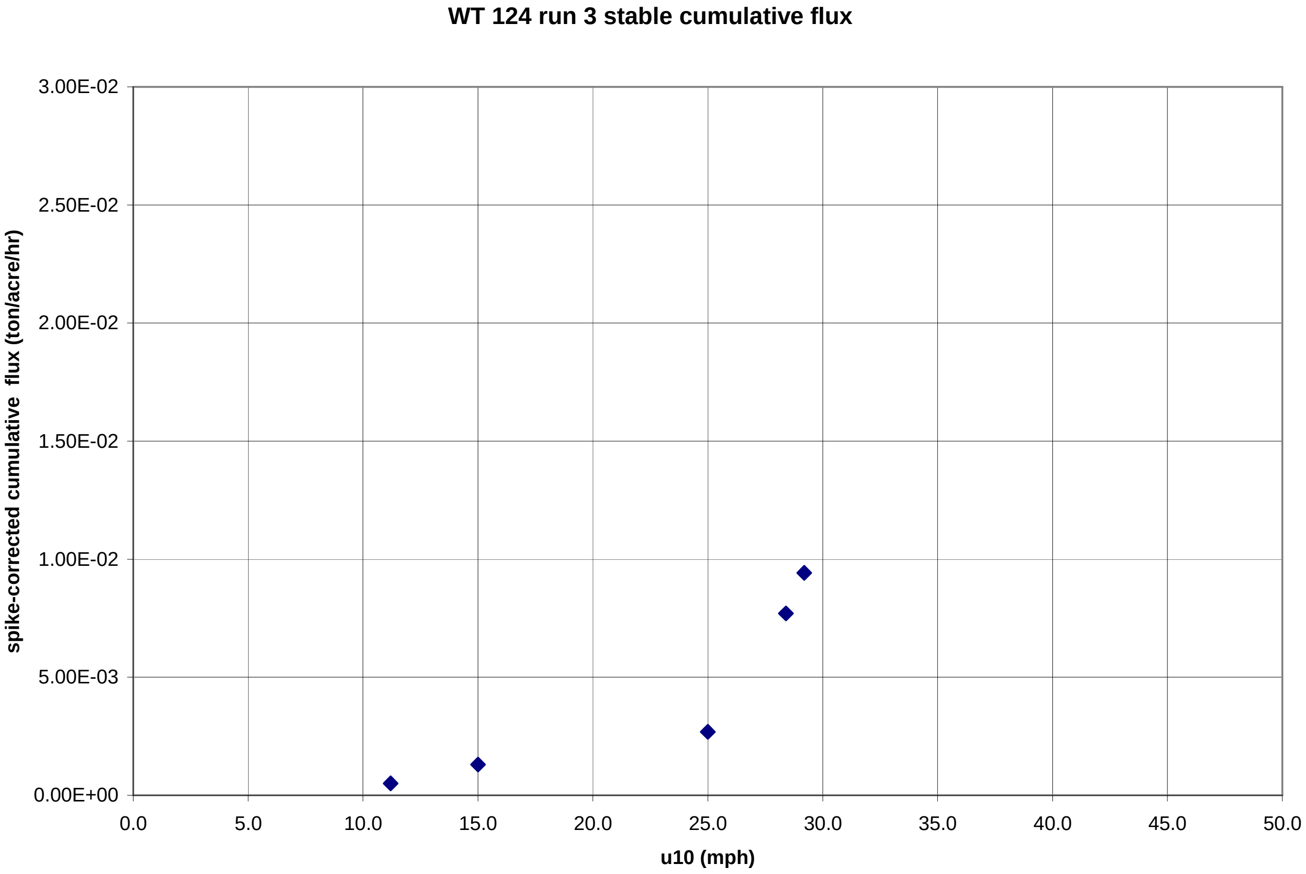
Appendix C (continued)

Figure 79 – U10 versus spike corrected flux – WT 124 2S



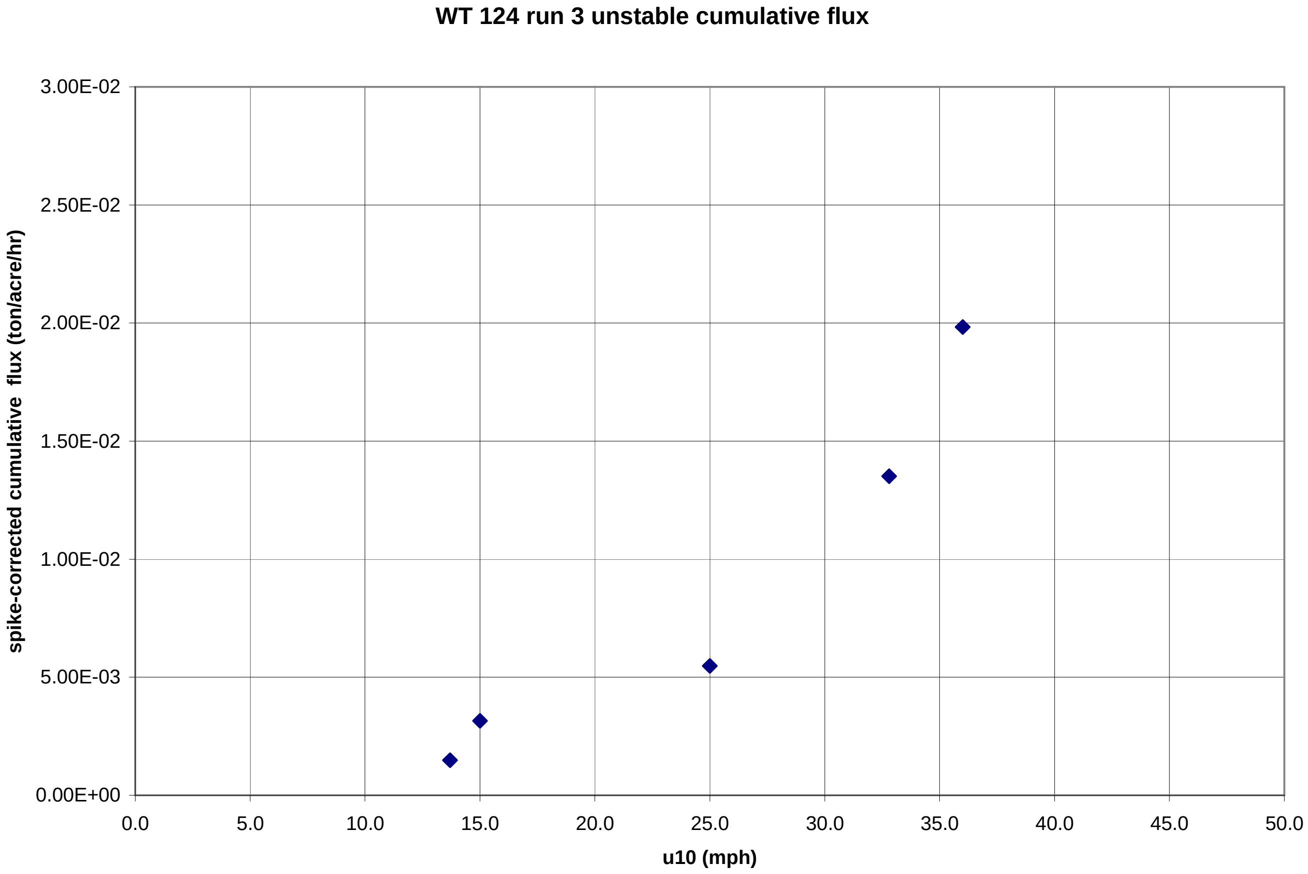
Appendix C (continued)

Figure 80 – U10 versus spike corrected flux – WT 124 3S



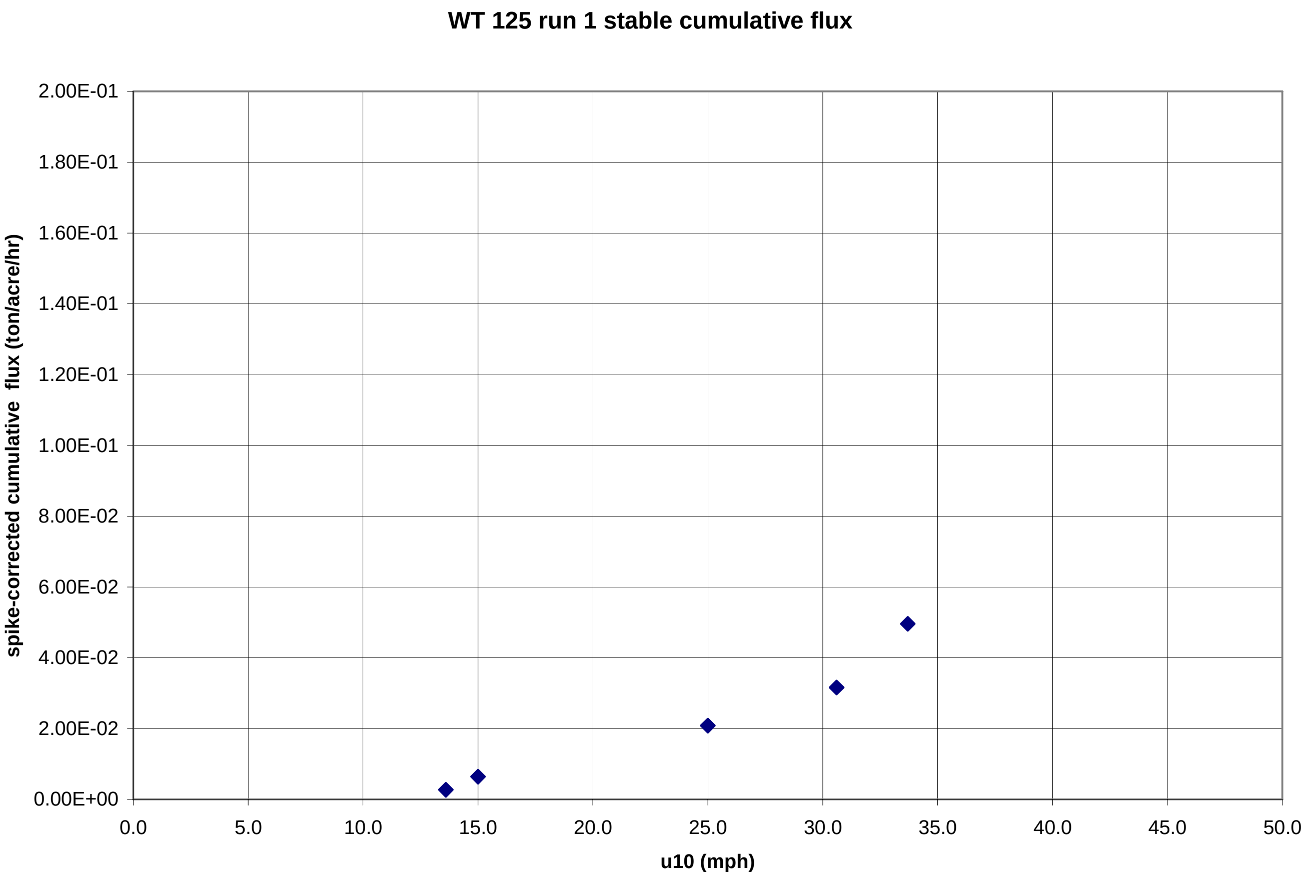
Appendix C (continued)

Figure 81 – U10 versus spike corrected flux – WT 124 3U



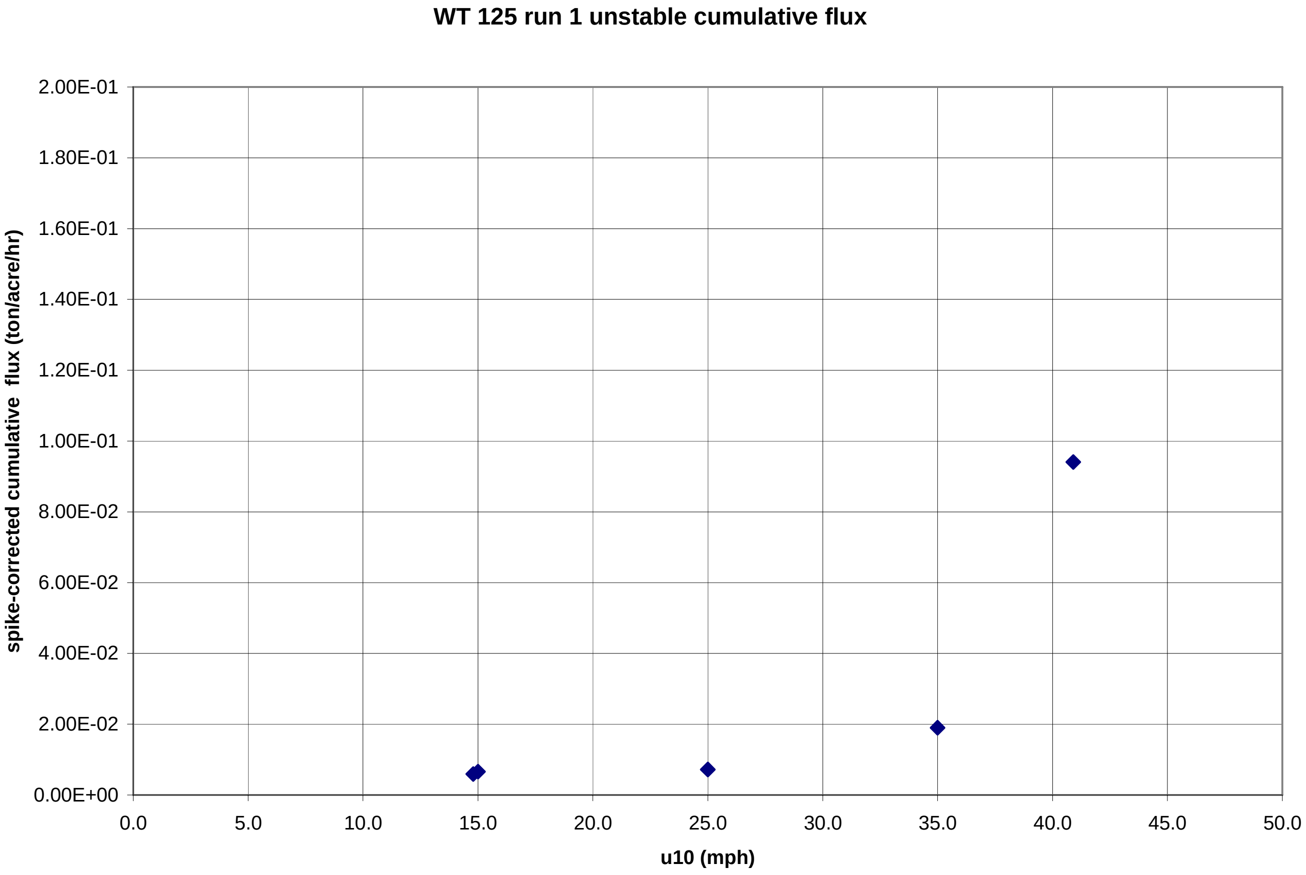
Appendix C (continued)

Figure 82 – U10 versus spike corrected flux – WT 125 1S



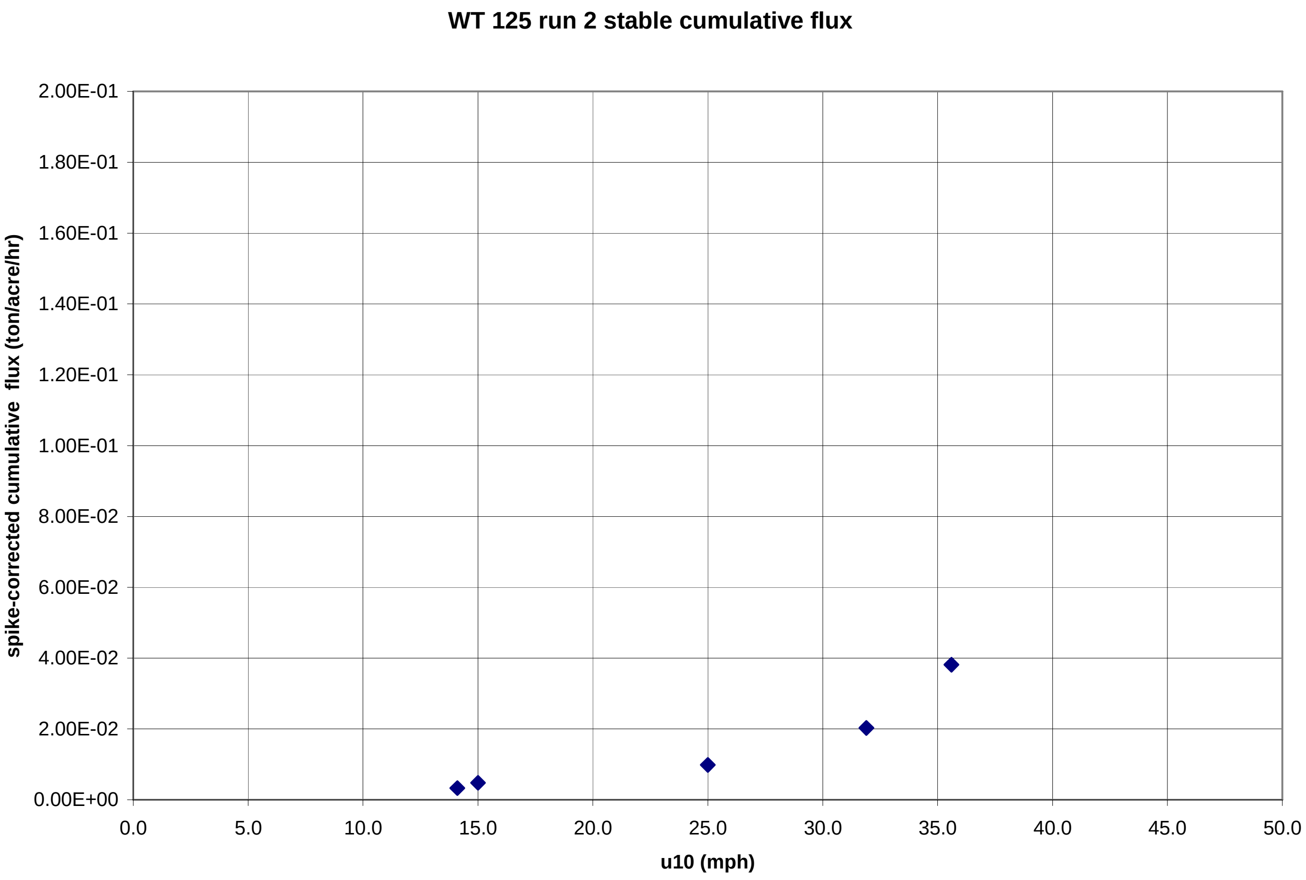
Appendix C (continued)

Figure 83 – U10 versus spike corrected flux – WT 125 1U



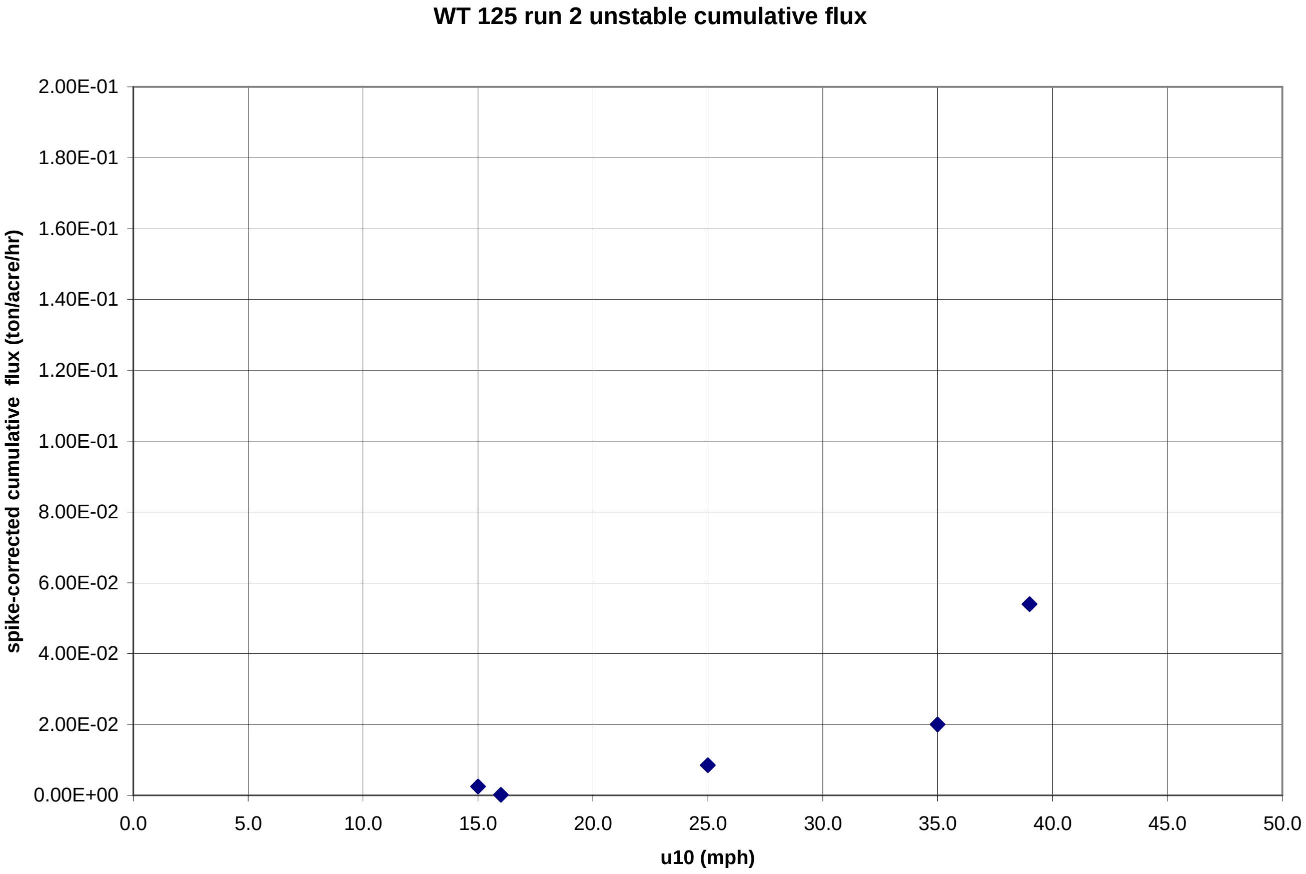
Appendix C (continued)

Figure 84 – U10 versus spike corrected flux – WT 125 2S



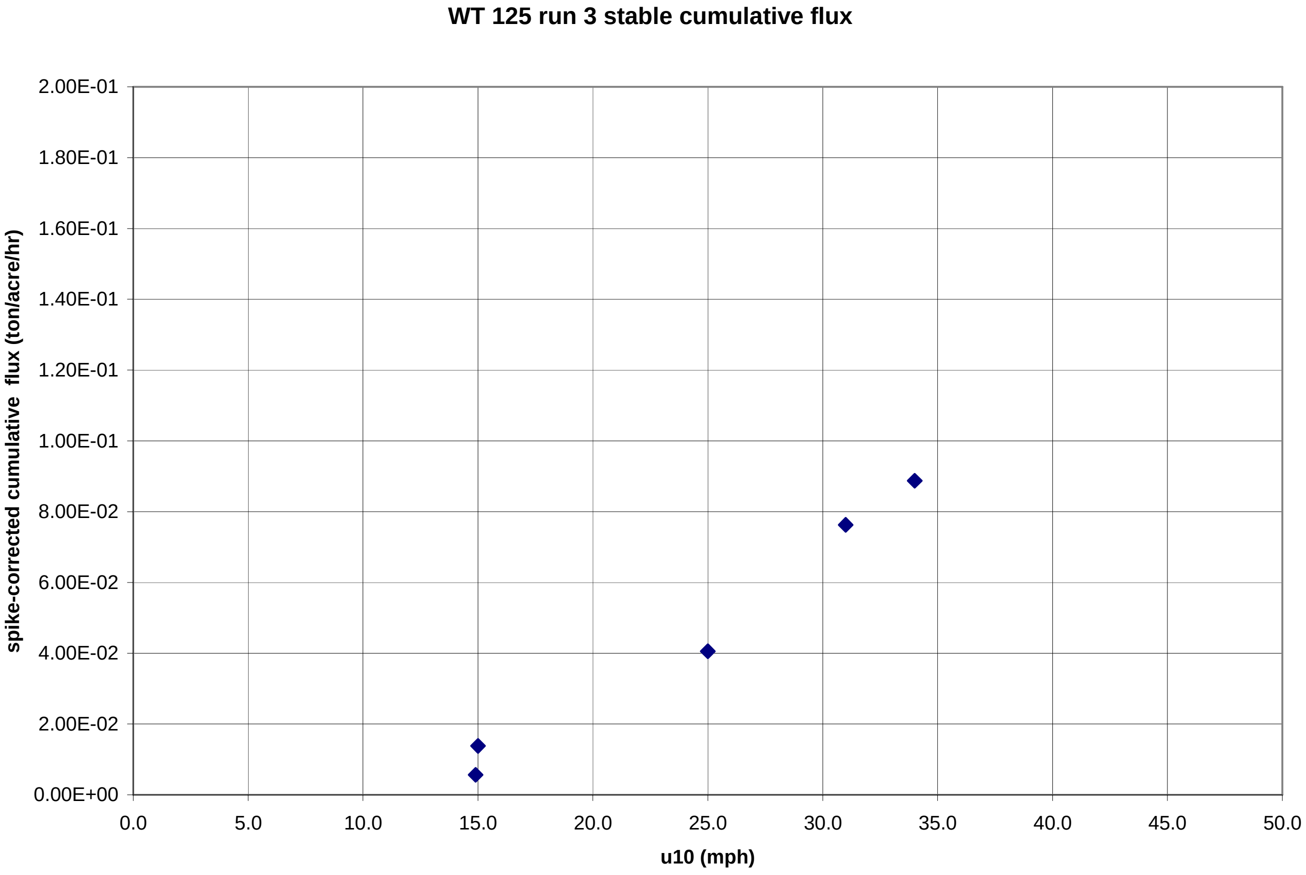
Appendix C (continued)

Figure 85 – U10 versus spike corrected flux – WT 125 2U



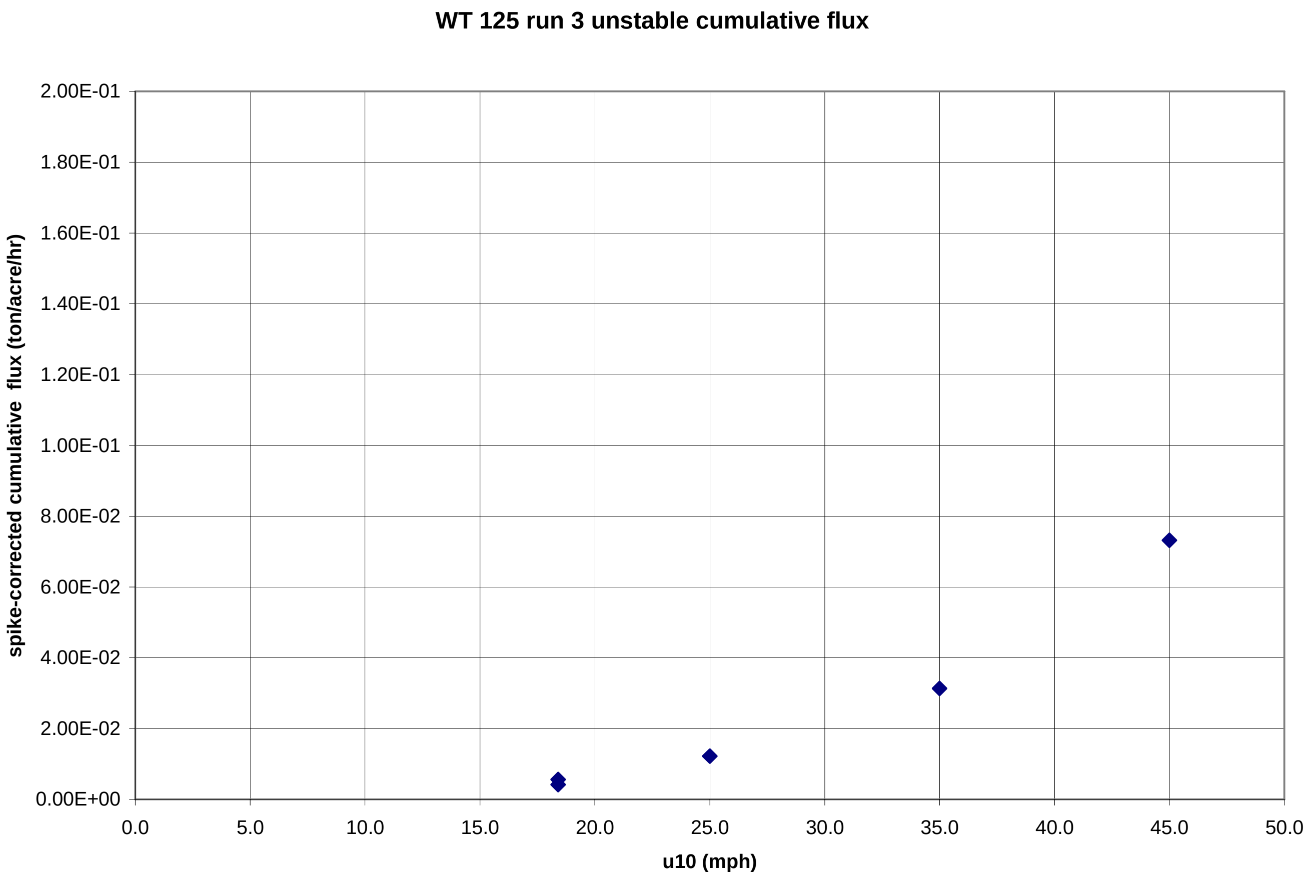
Appendix C (continued)

Figure 86 – U10 versus spike corrected flux – WT 125 3S



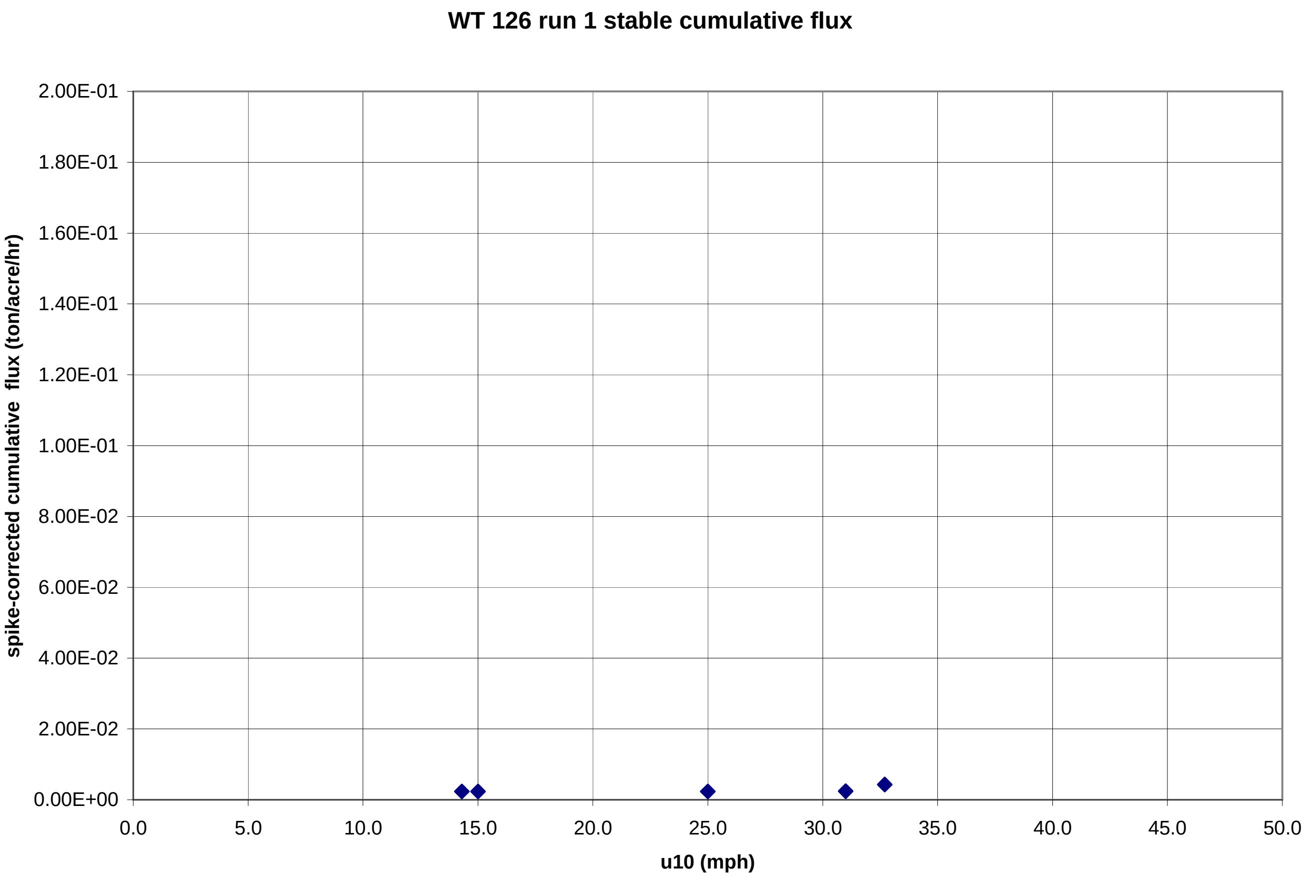
Appendix C (continued)

Figure 87 – U10 versus spike corrected flux – WT 125 3U



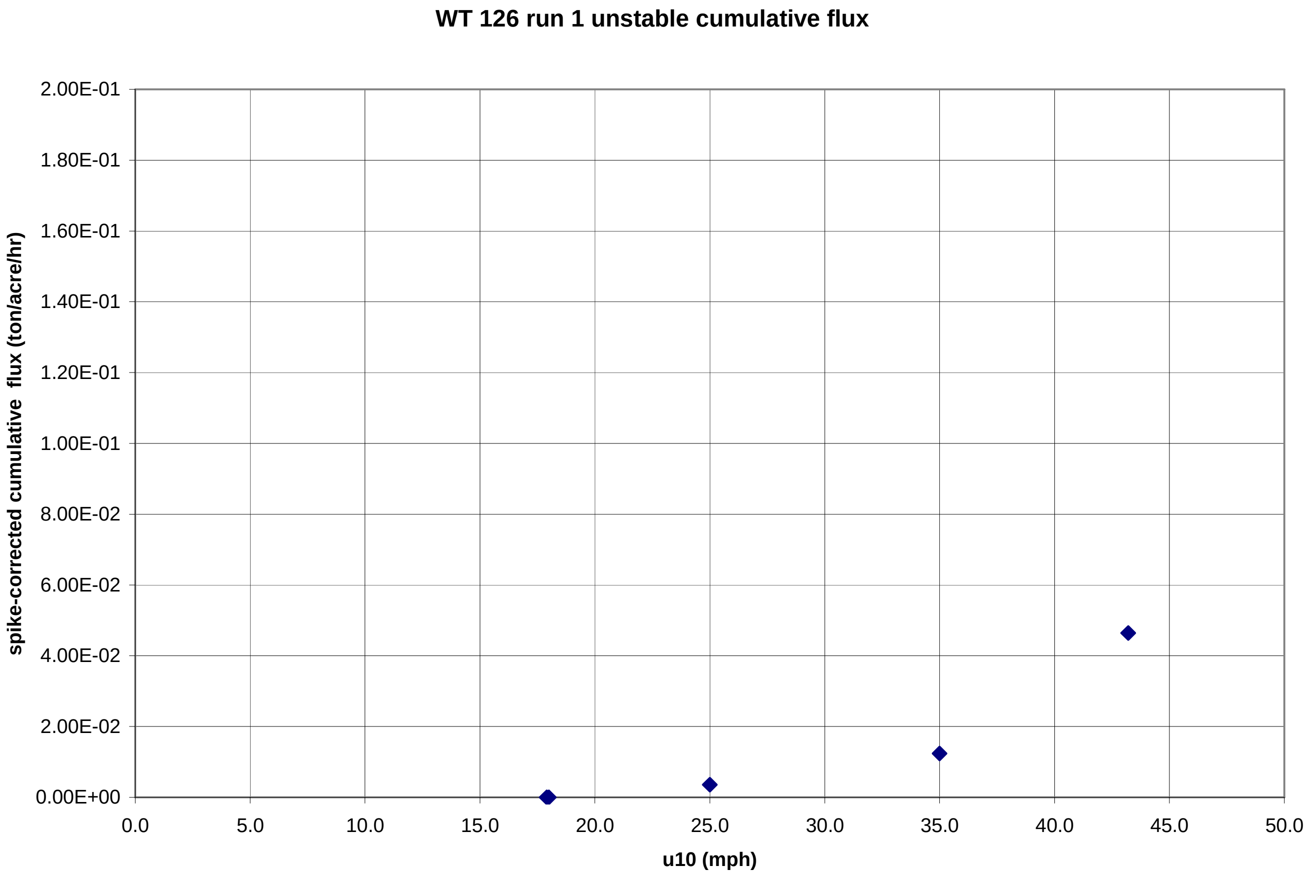
Appendix C (continued)

Figure 88 – U10 versus spike corrected flux – WT 126 1S



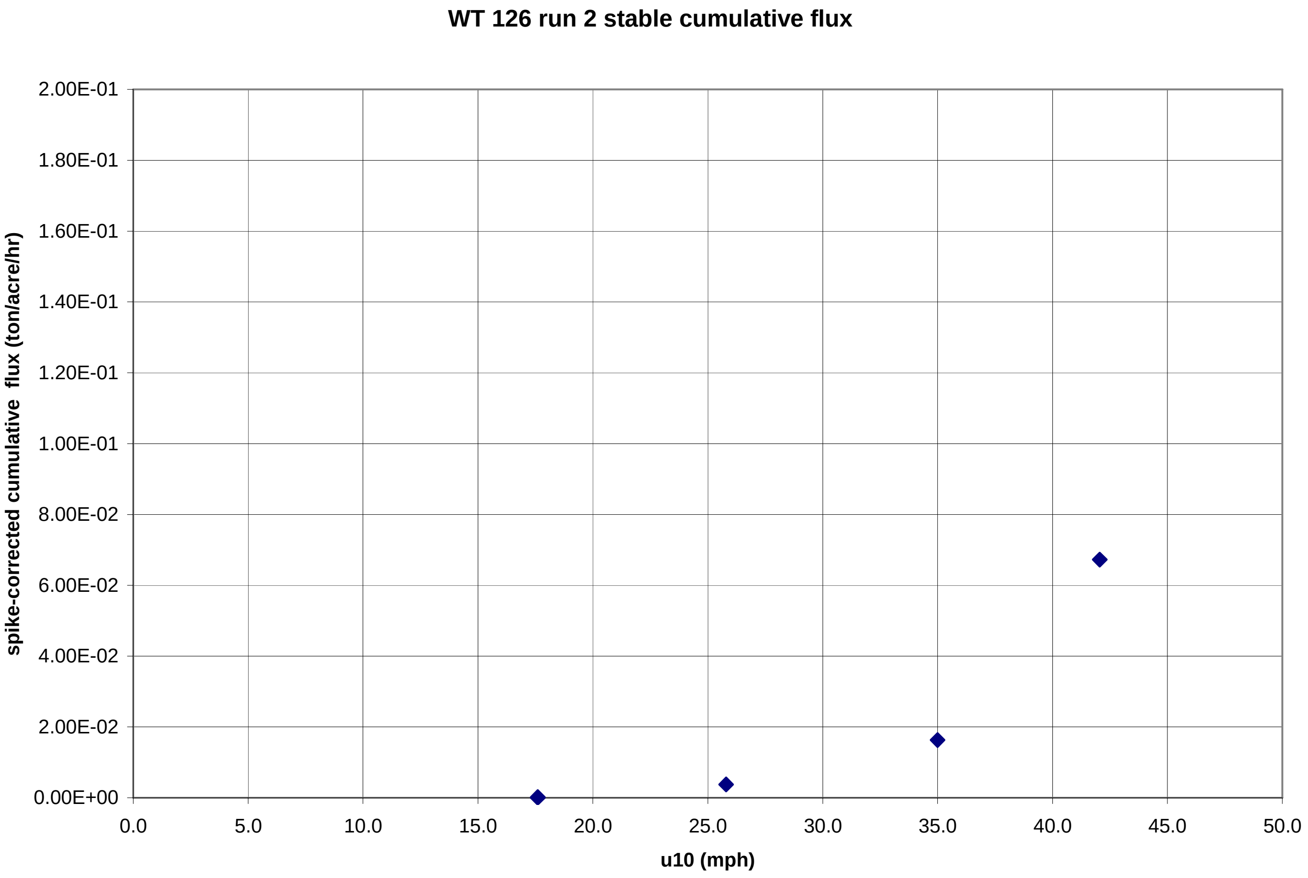
Appendix C (continued)

Figure 89 – U10 versus spike corrected flux – WT 126 1U



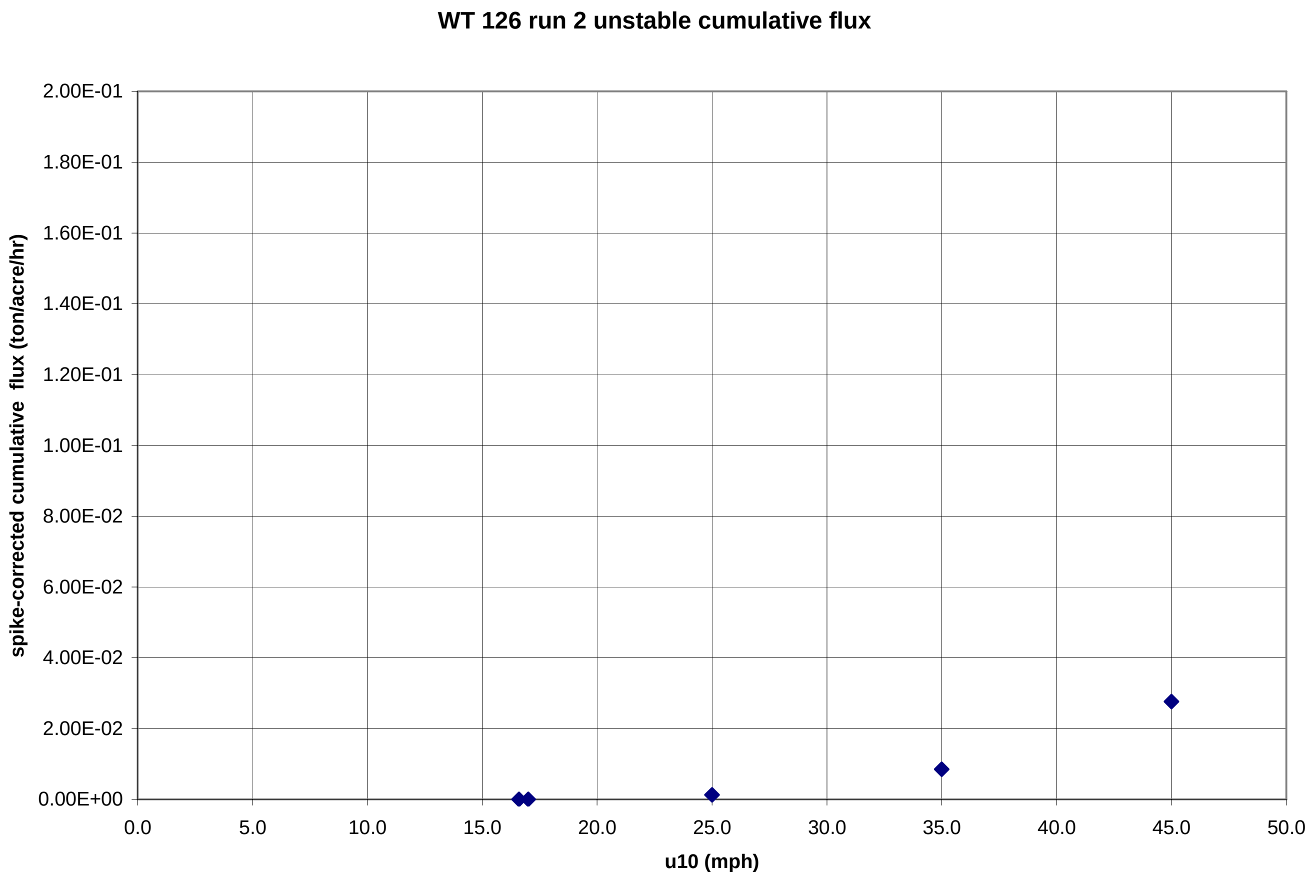
Appendix C (continued)

Figure 90 – U10 versus spike corrected flux – WT 126 2S



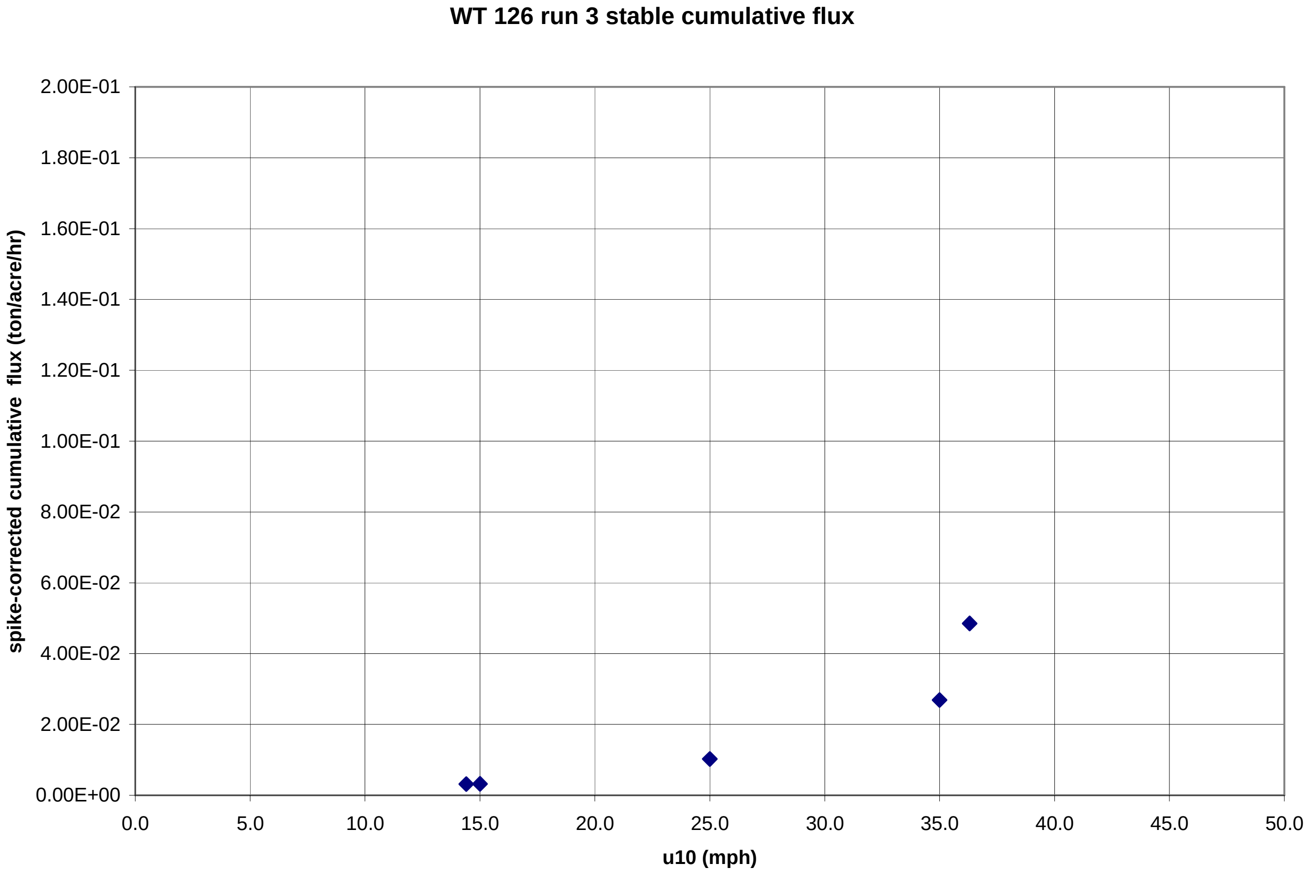
Appendix C (continued)

Figure 91 – U10 versus spike corrected flux – WT 126 2U



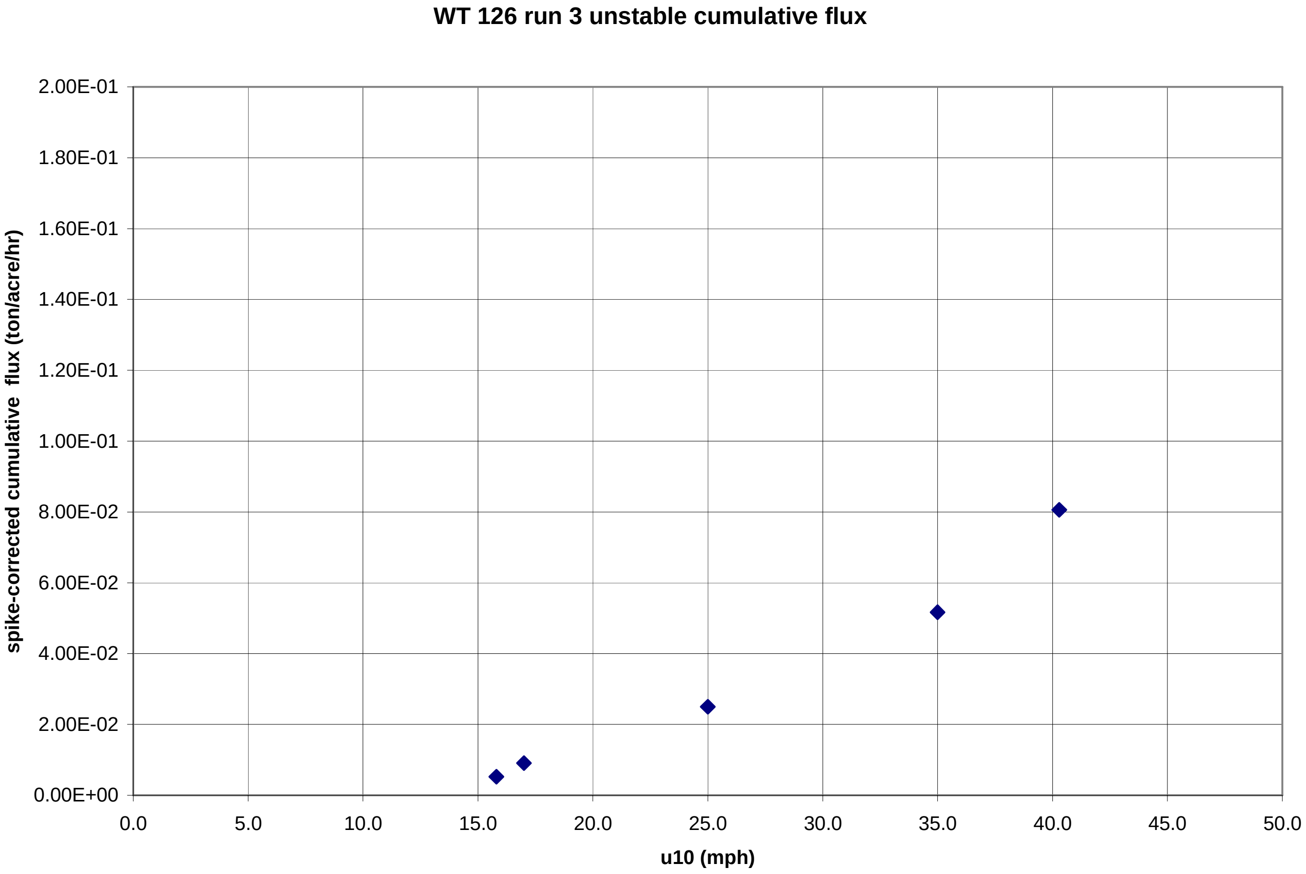
Appendix C (continued)

Figure 92 – U10 versus spike corrected flux – WT 126 3S



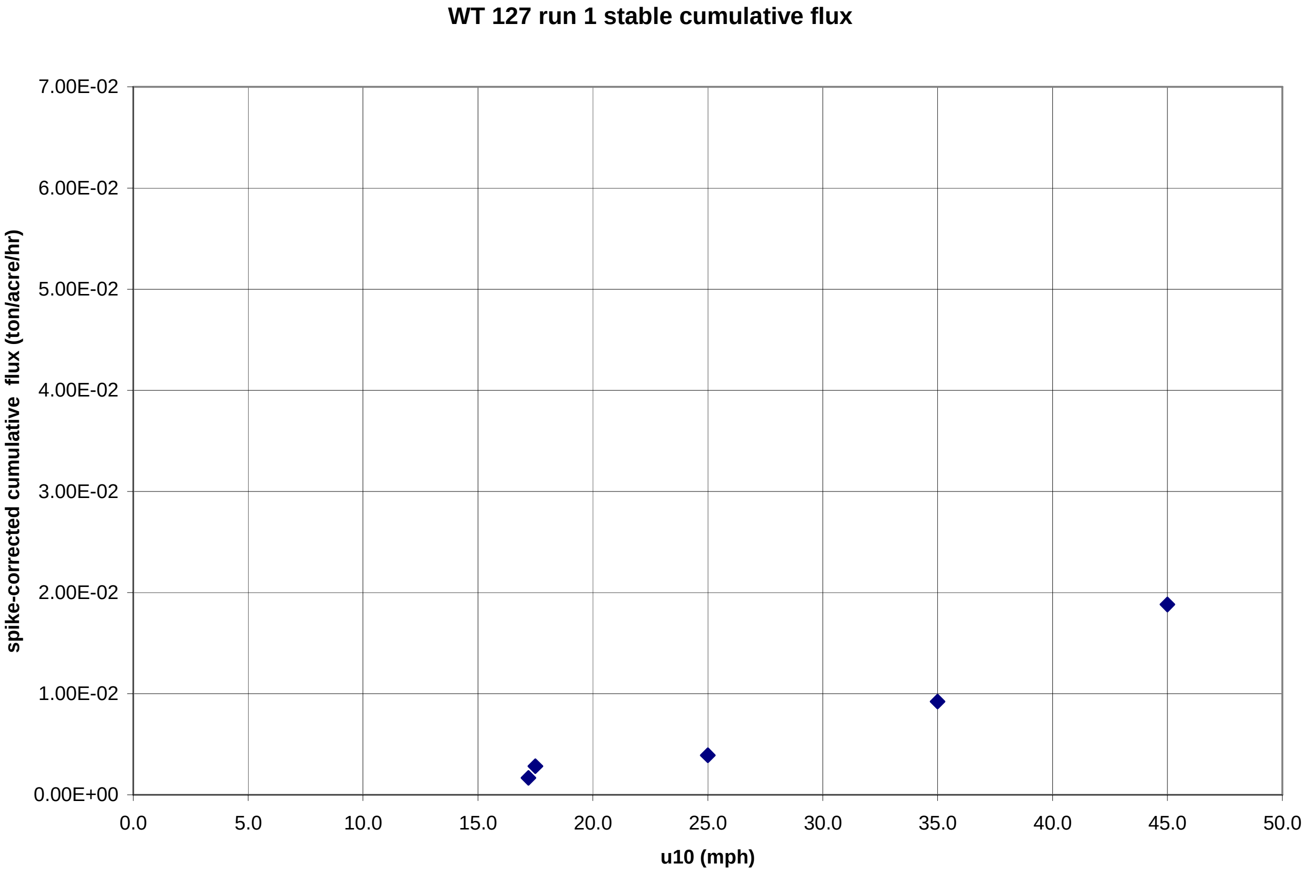
Appendix C (continued)

Figure 93 – U10 versus spike corrected flux – WT 126 3U



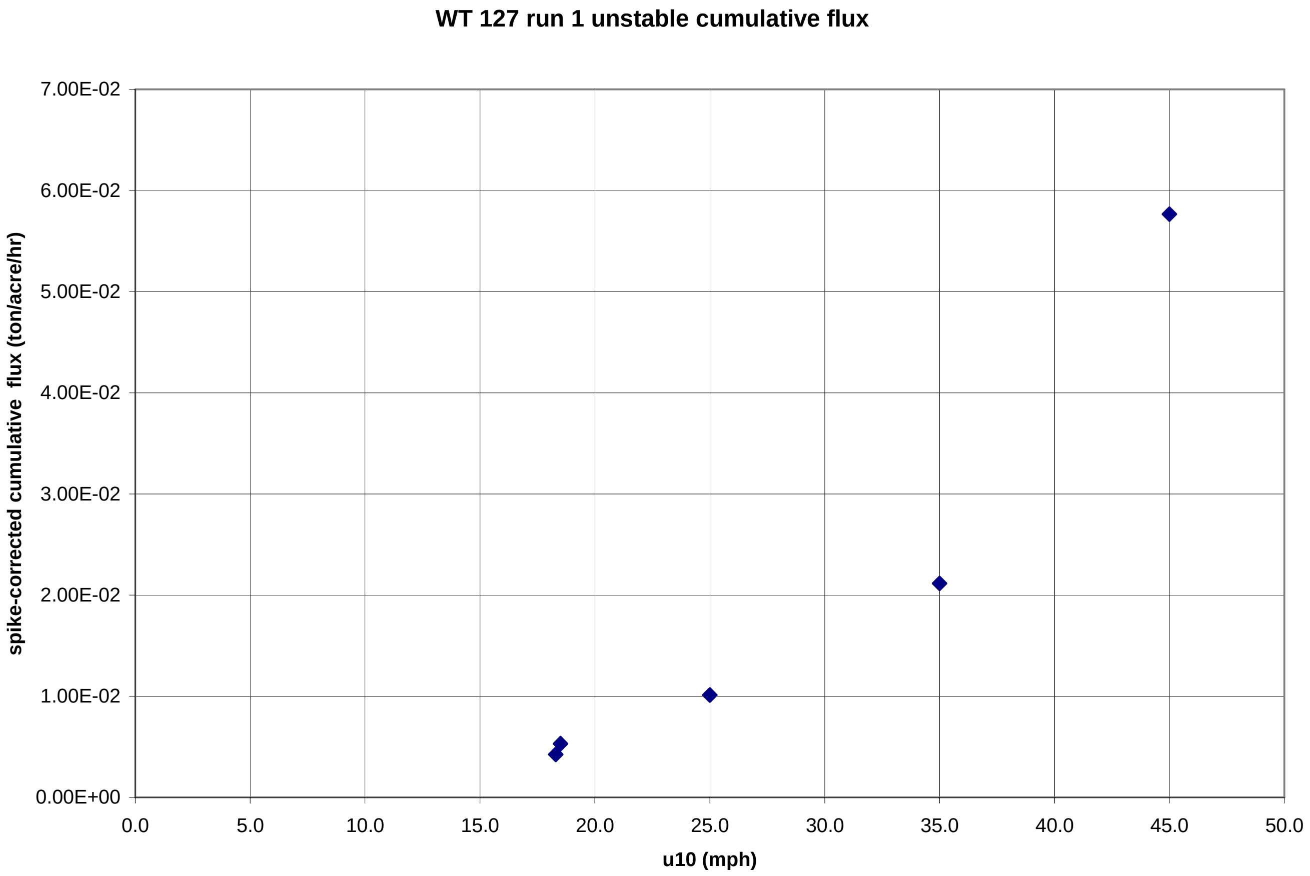
Appendix C (continued)

Figure 94 – U10 versus spike corrected flux – WT 127 1S



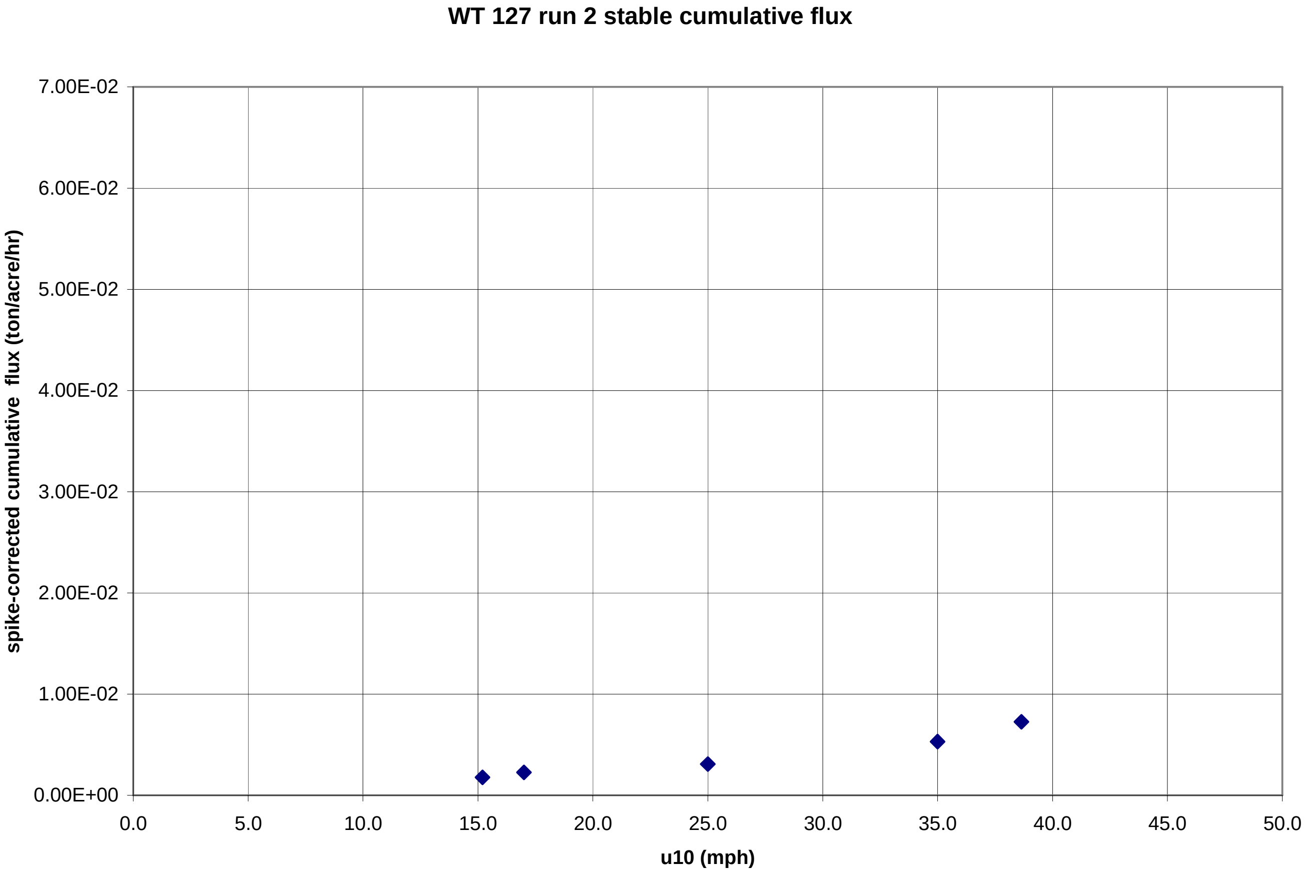
Appendix C (continued)

Figure 95 – U10 versus spike corrected flux – WT 127 1U



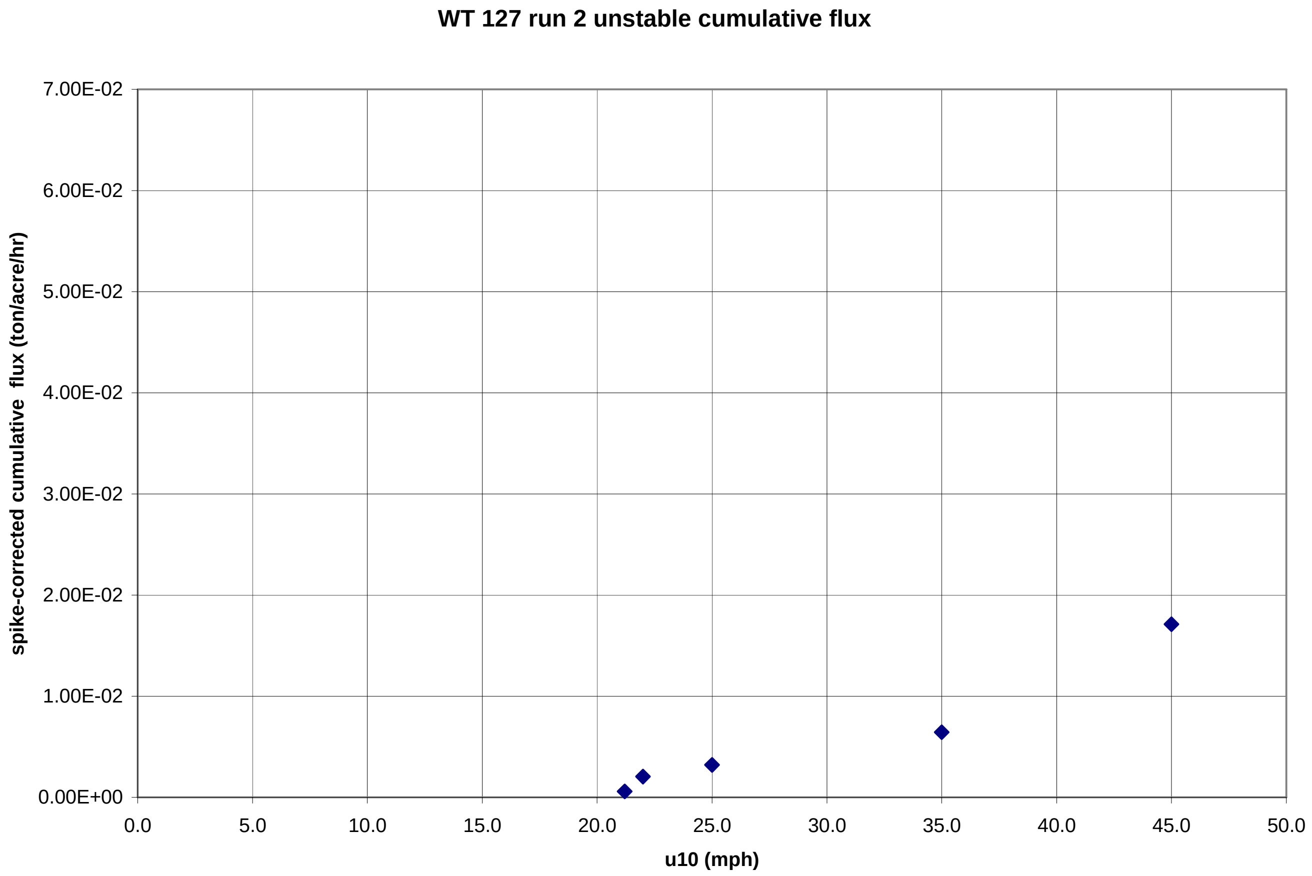
Appendix C (continued)

Figure 96 – U10 versus spike corrected flux – WT 127 2S



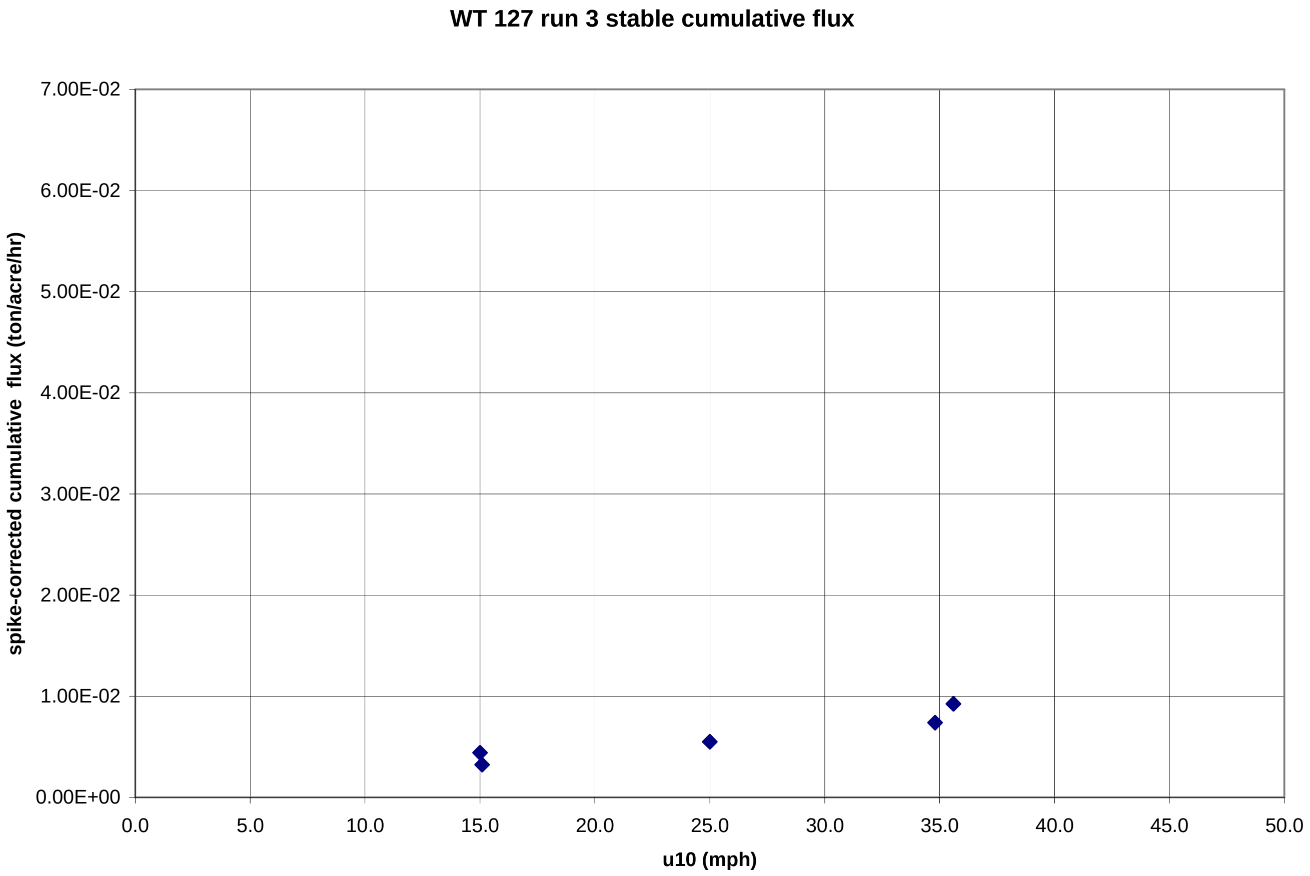
Appendix C (continued)

Figure 97 – U10 versus spike corrected flux – WT 127 2U



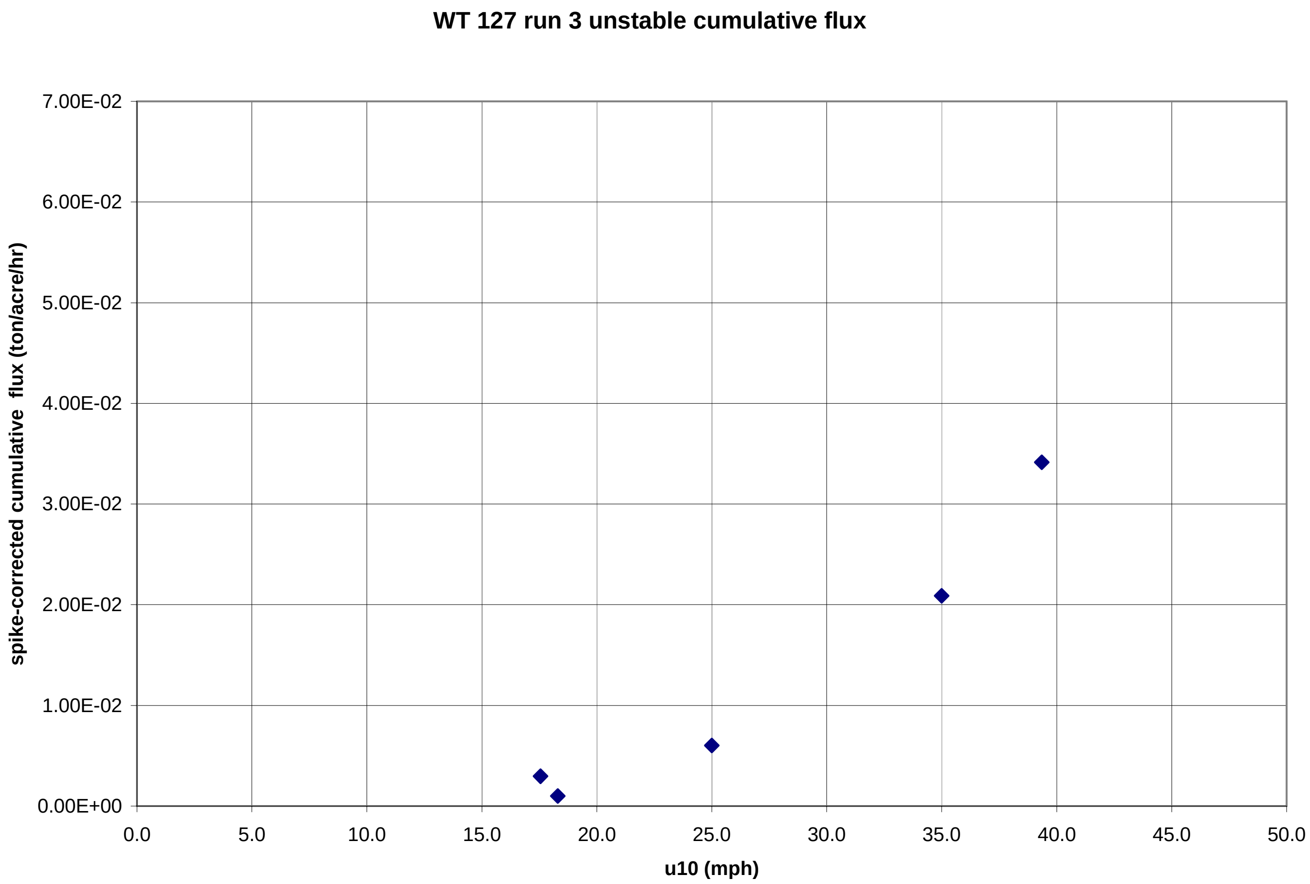
Appendix C (continued)

Figure 98 – U10 versus spike corrected flux – WT 127 3S



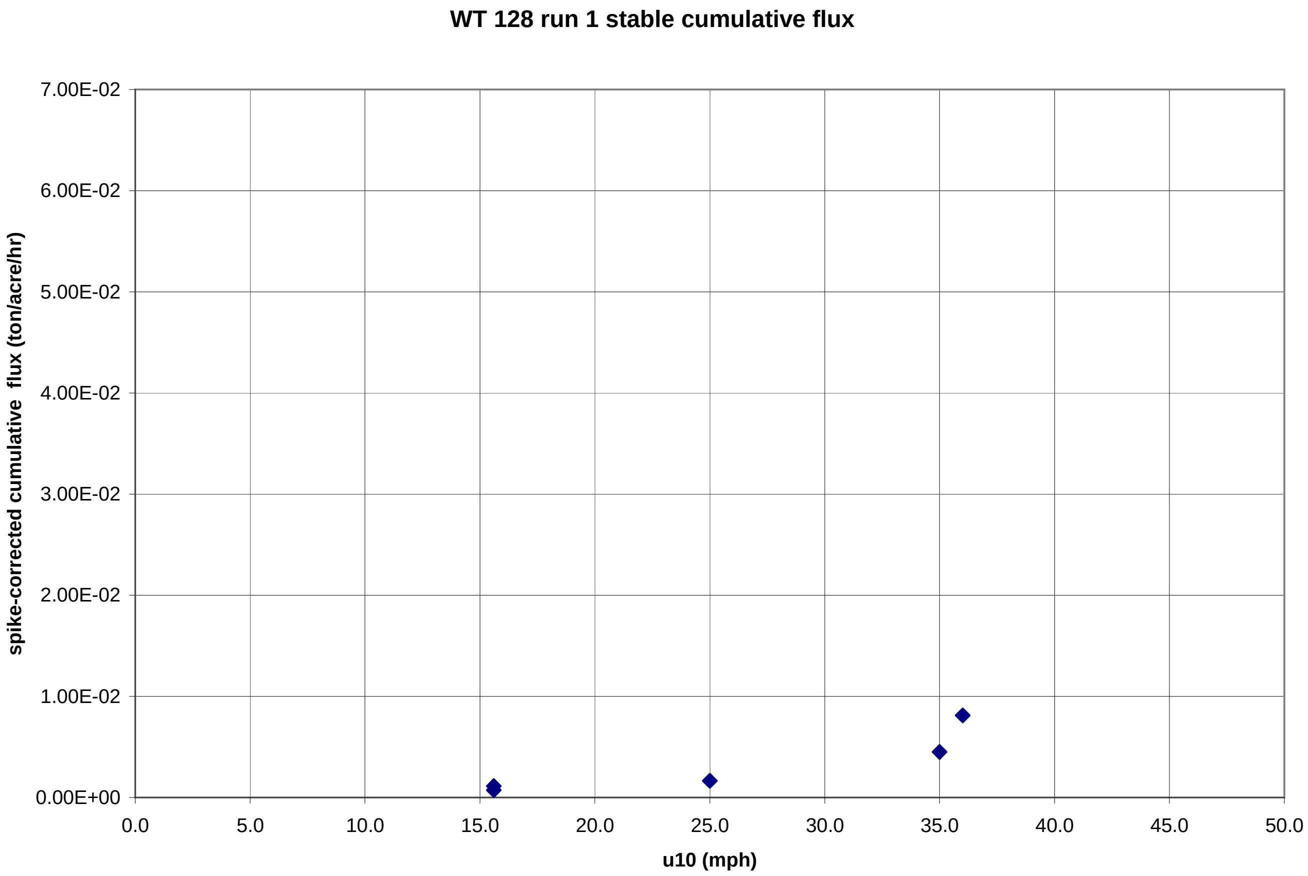
Appendix C (continued)

Figure 99 – U10 versus spike corrected flux – WT 127 3U



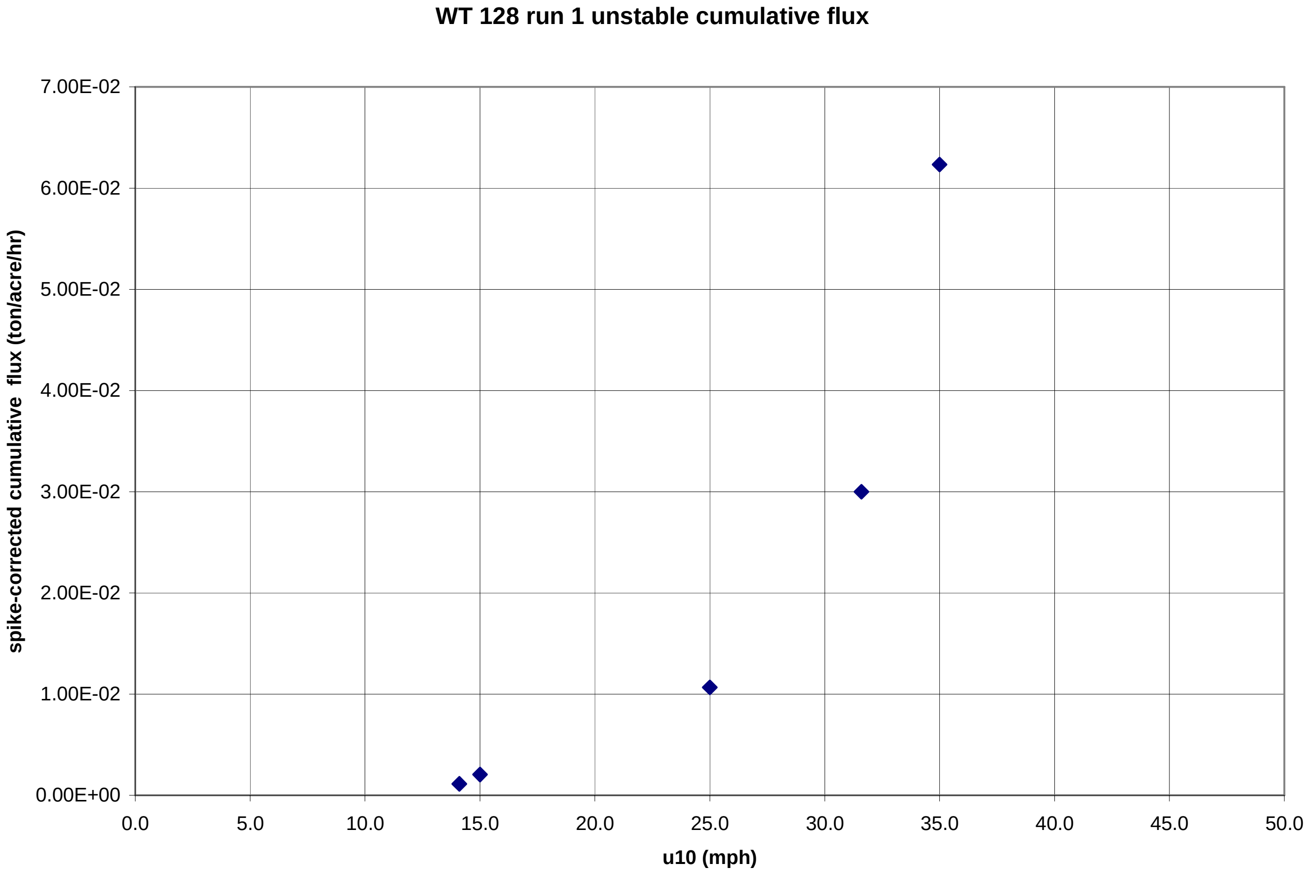
Appendix C (continued)

Figure 100 – U10 versus spike corrected flux – WT 128 1S



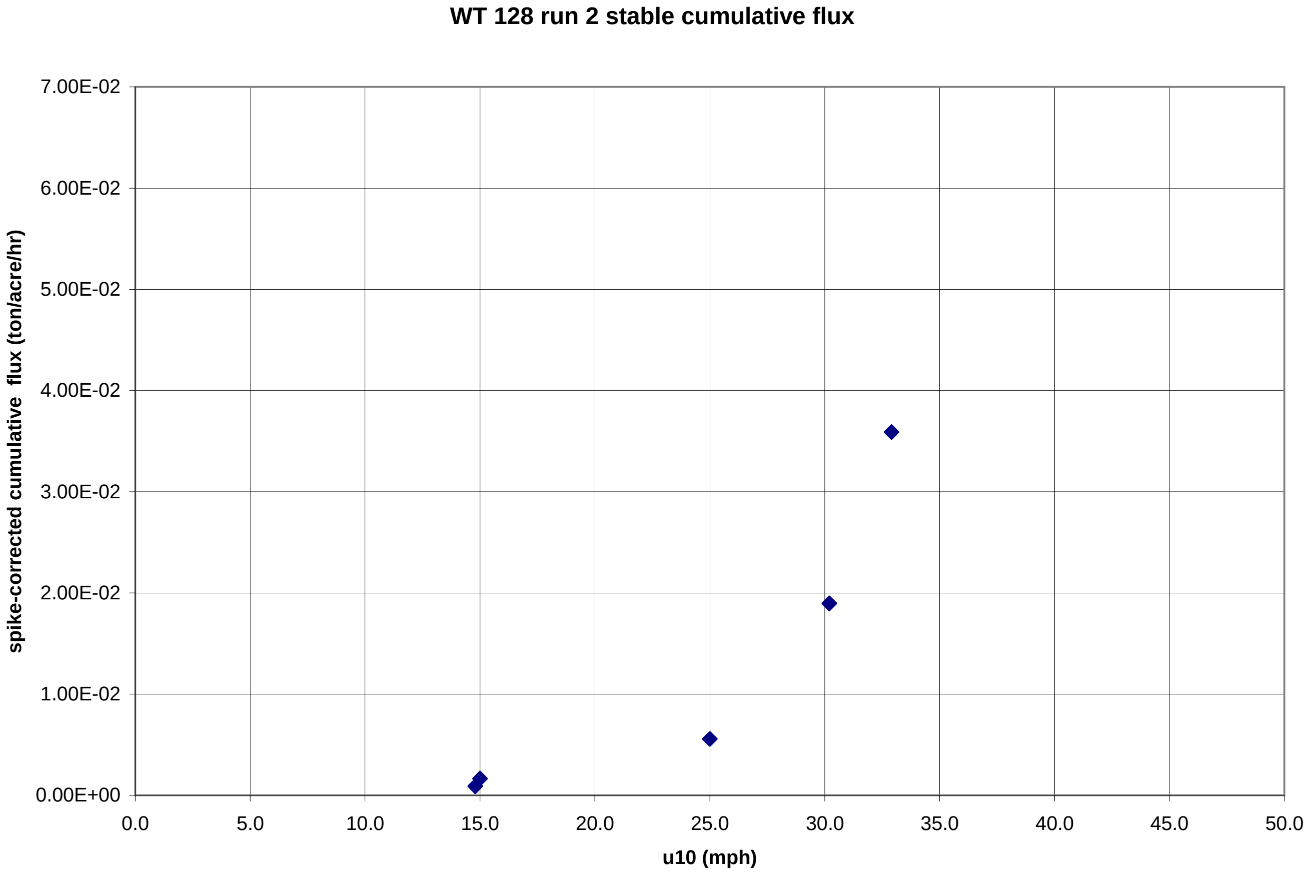
Appendix C (continued)

Figure 101 – U10 versus spike corrected flux – WT 128 1U



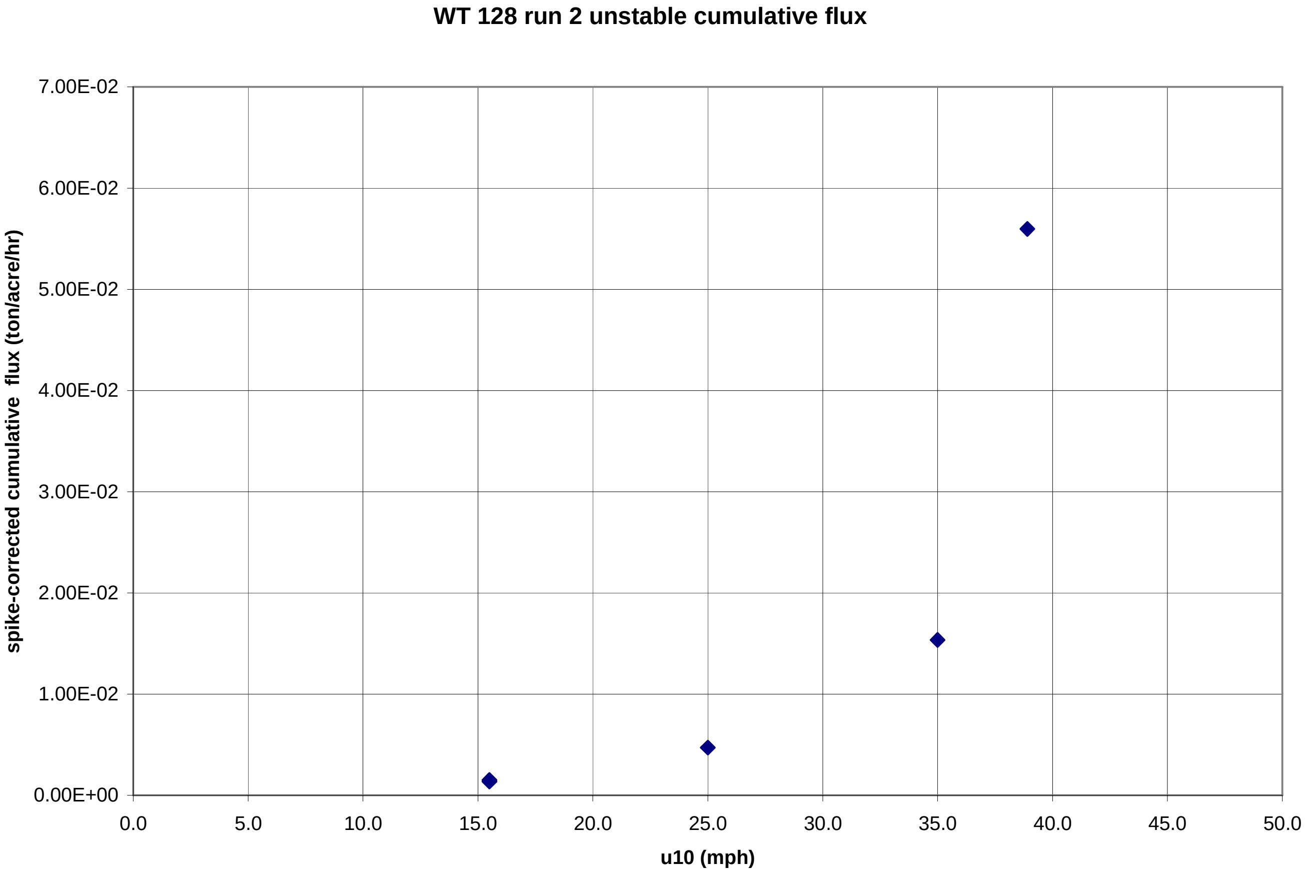
Appendix C (continued)

Figure 102 – U10 versus spike corrected flux – WT 128 2S



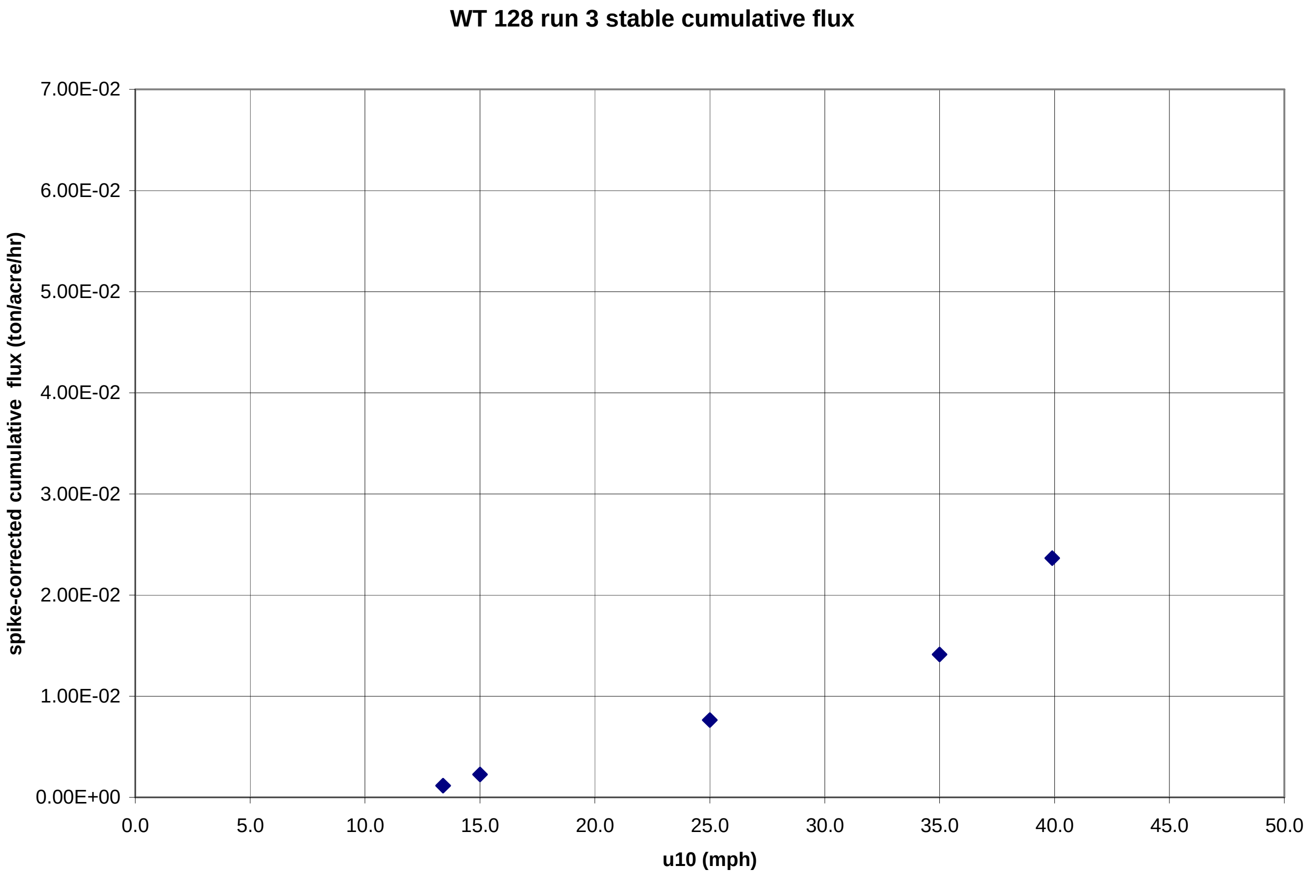
Appendix C (continued)

Figure 103 – U10 versus spike corrected flux – WT 128 2U



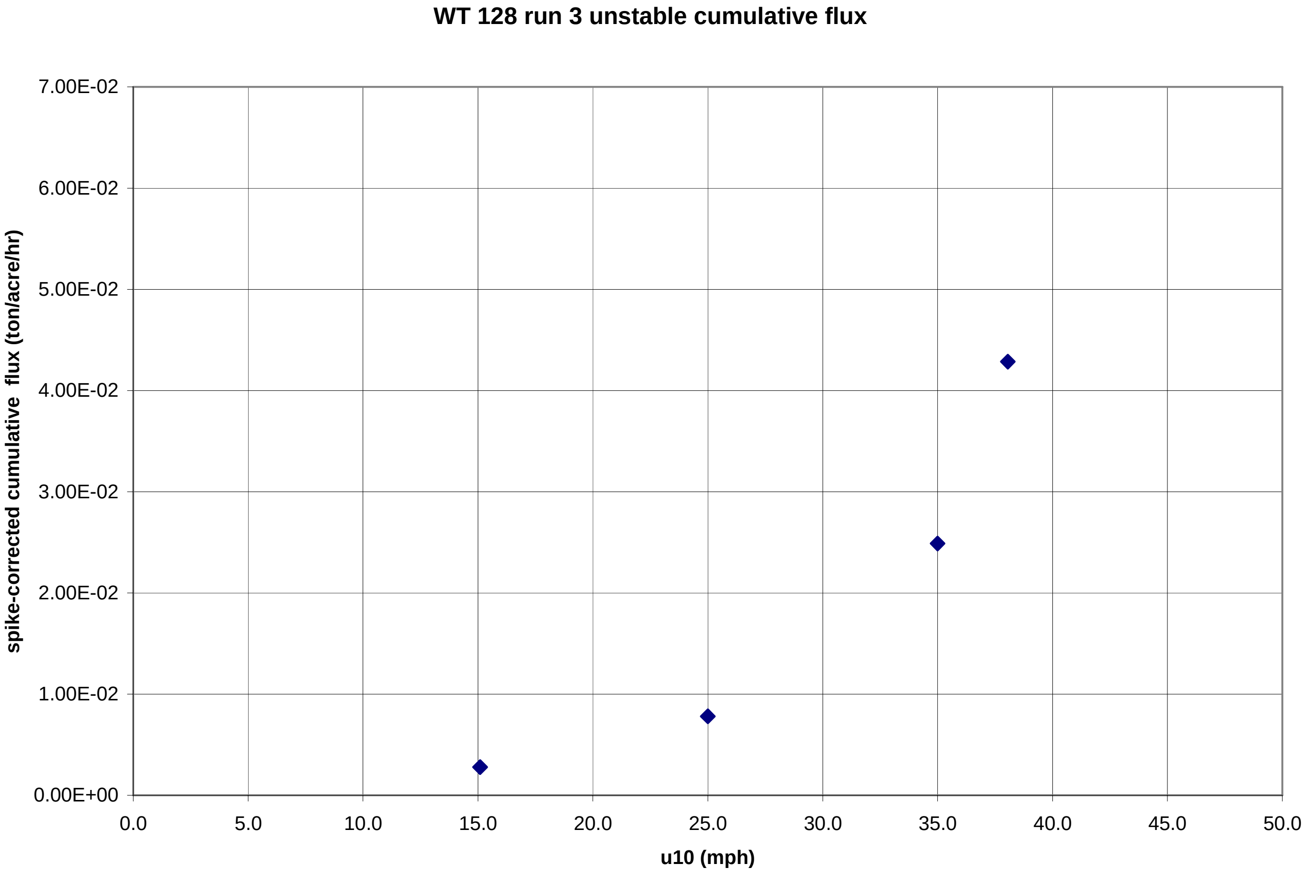
Appendix C (continued)

Figure 104 – U10 versus spike corrected flux – WT 128 3S



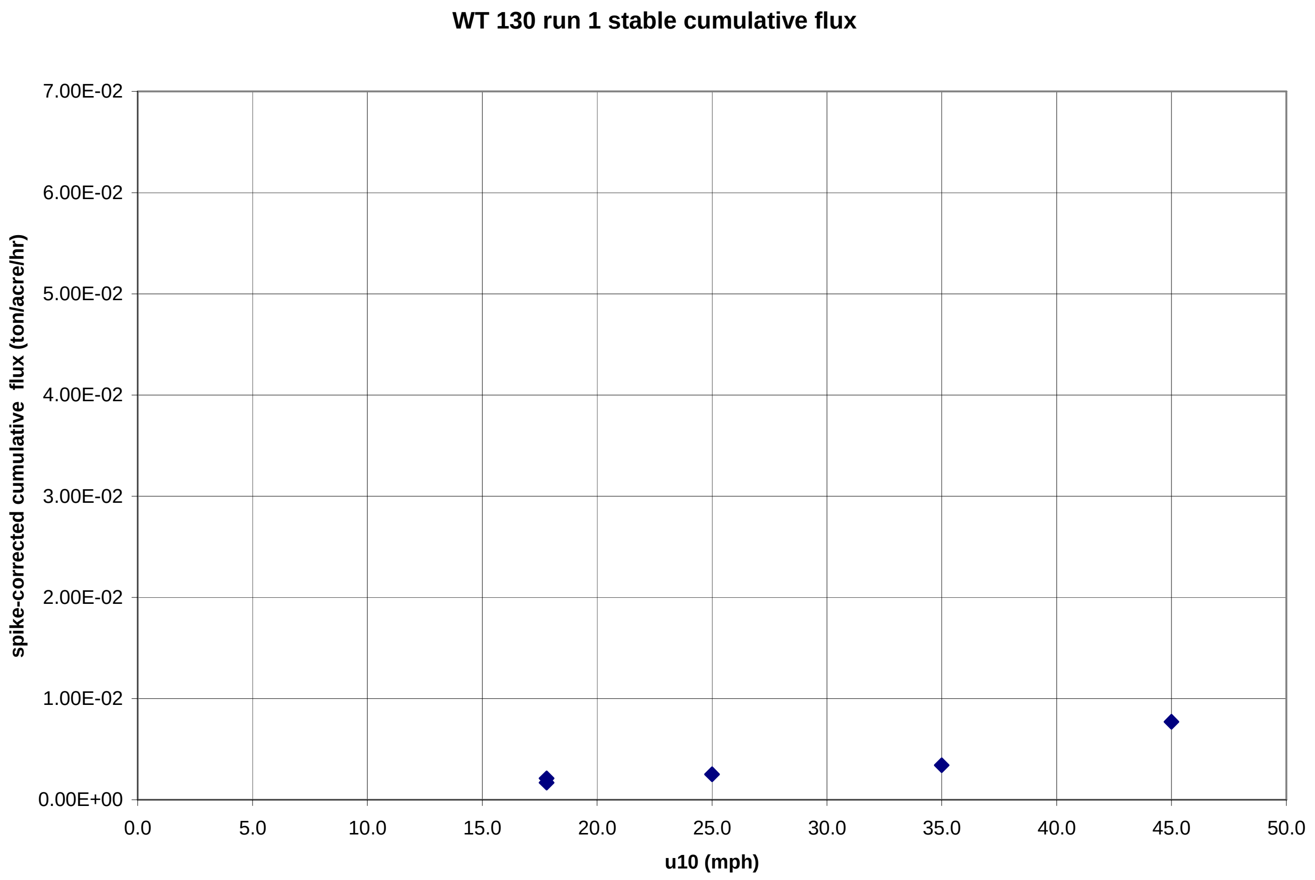
Appendix C (continued)

Figure 105 – U10 versus spike corrected flux – WT 128 3U



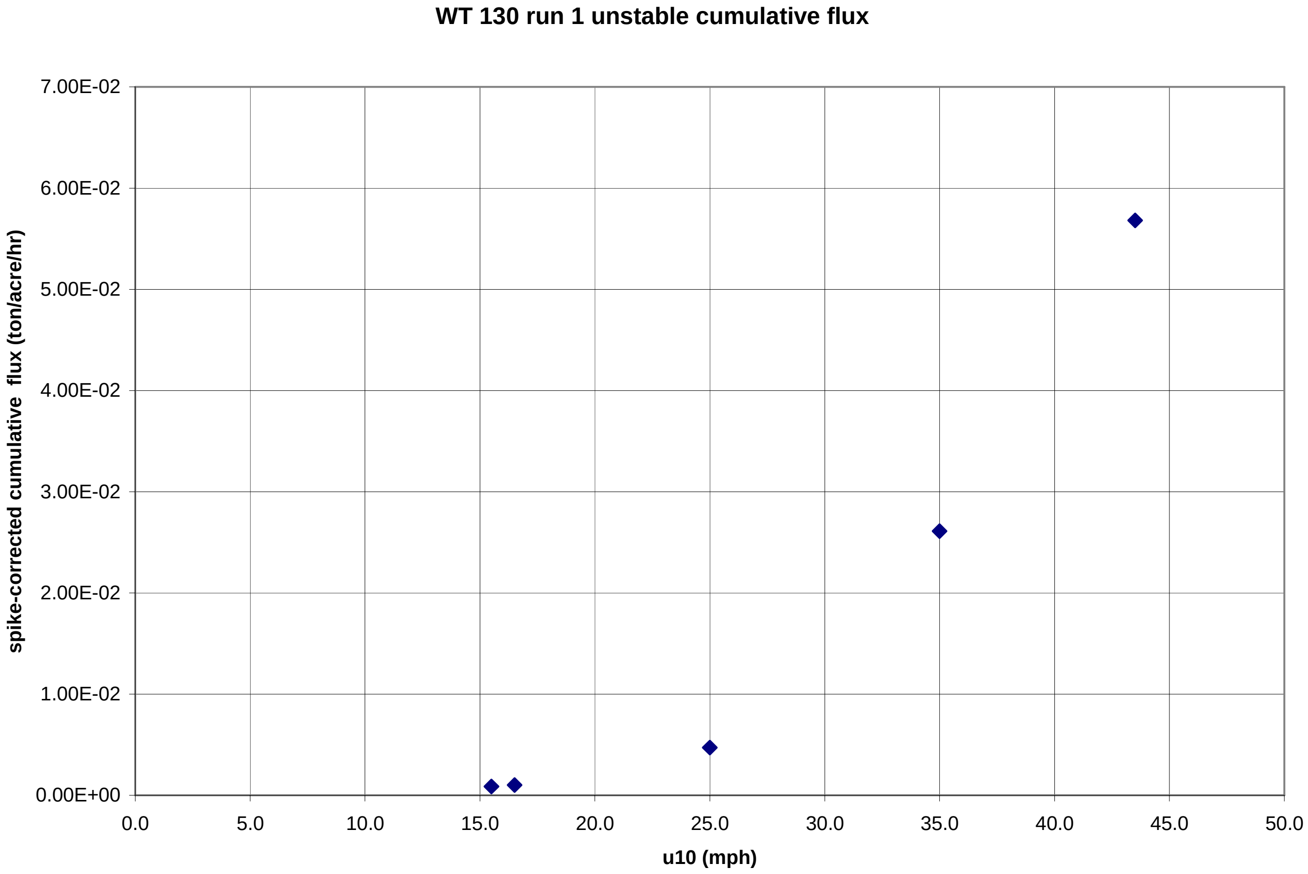
Appendix C (continued)

Figure 106 – U10 versus spike corrected flux – WT 130 1S



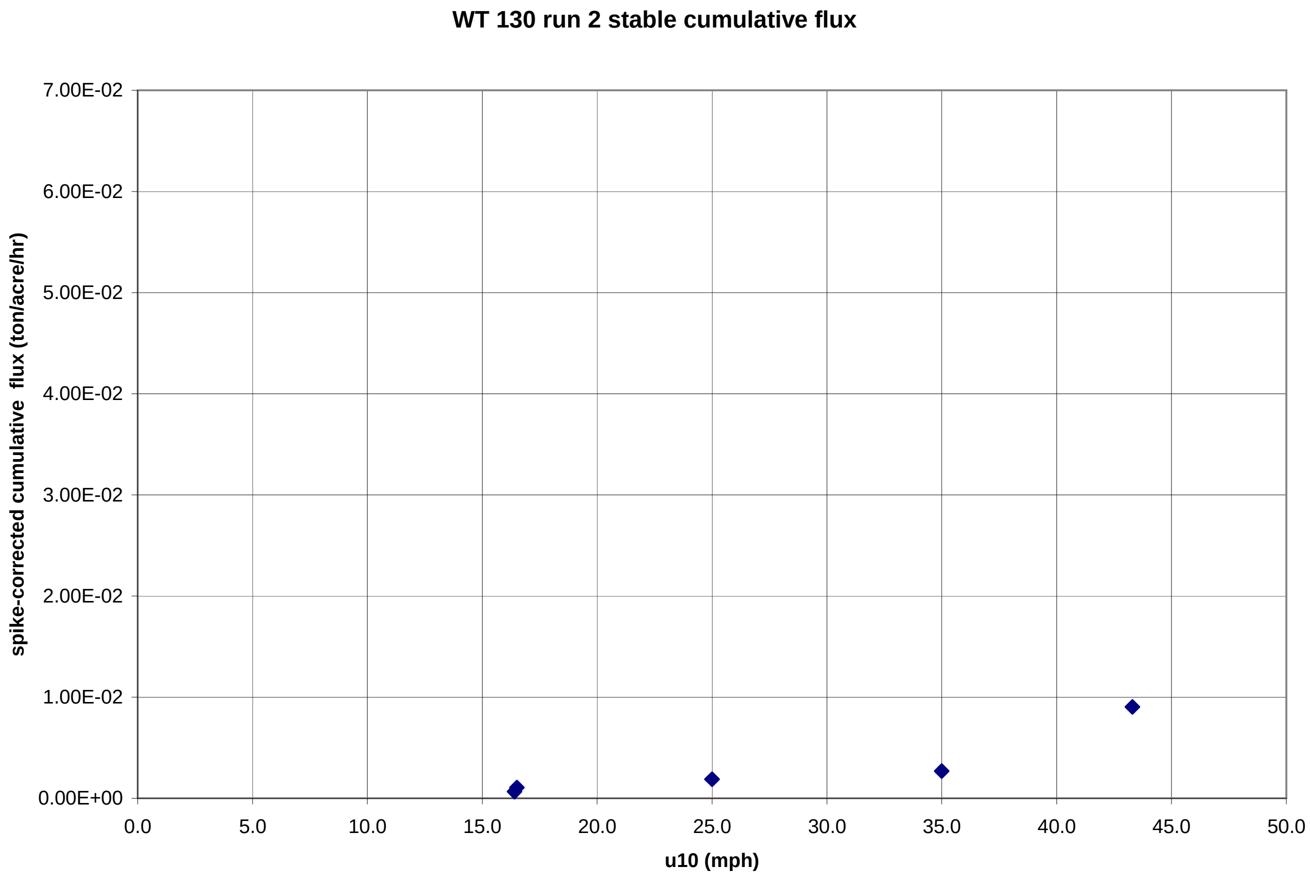
Appendix C (continued)

Figure 107 – U10 versus spike corrected flux – WT 130 1U



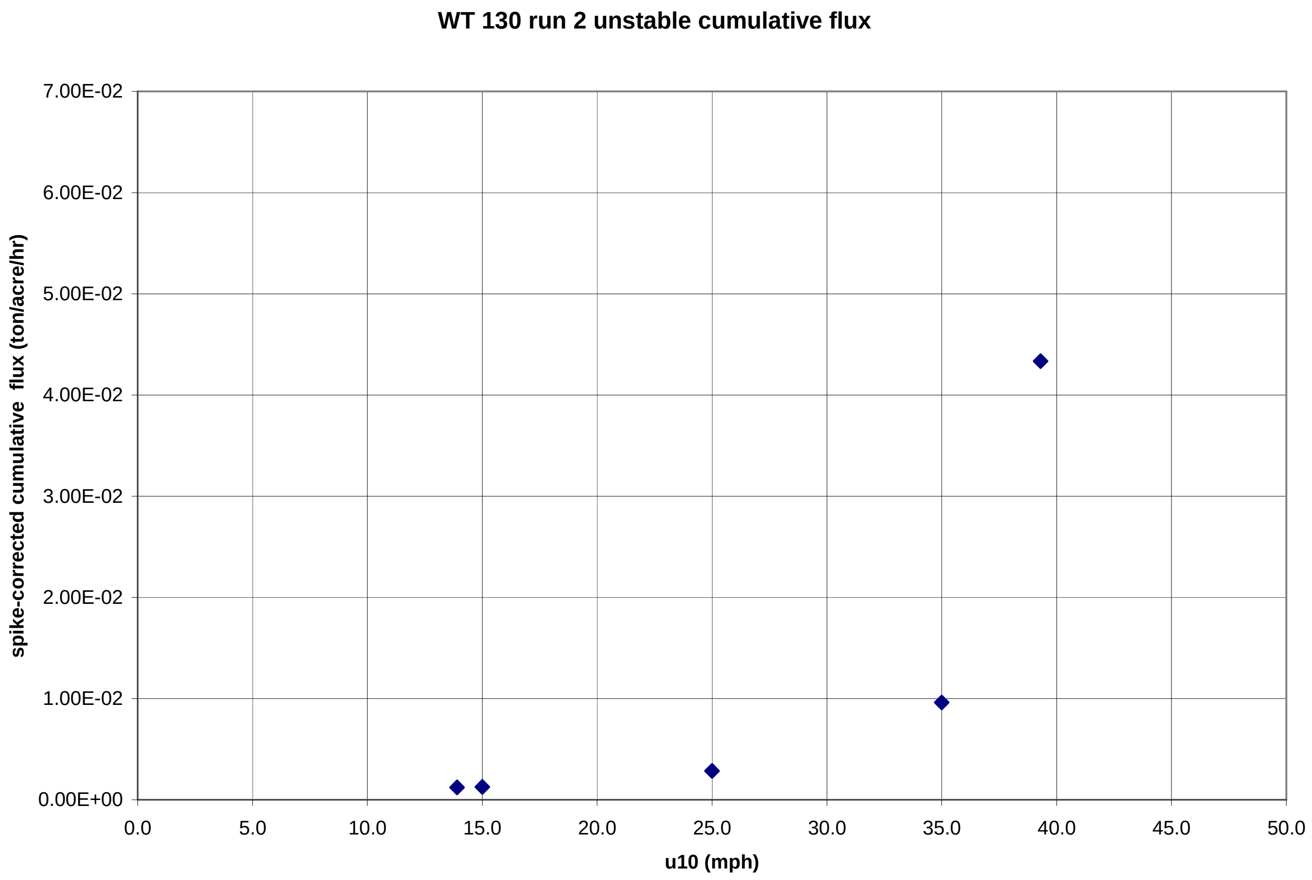
Appendix C (continued)

Figure 108 – U10 versus spike corrected flux – WT 130 2S



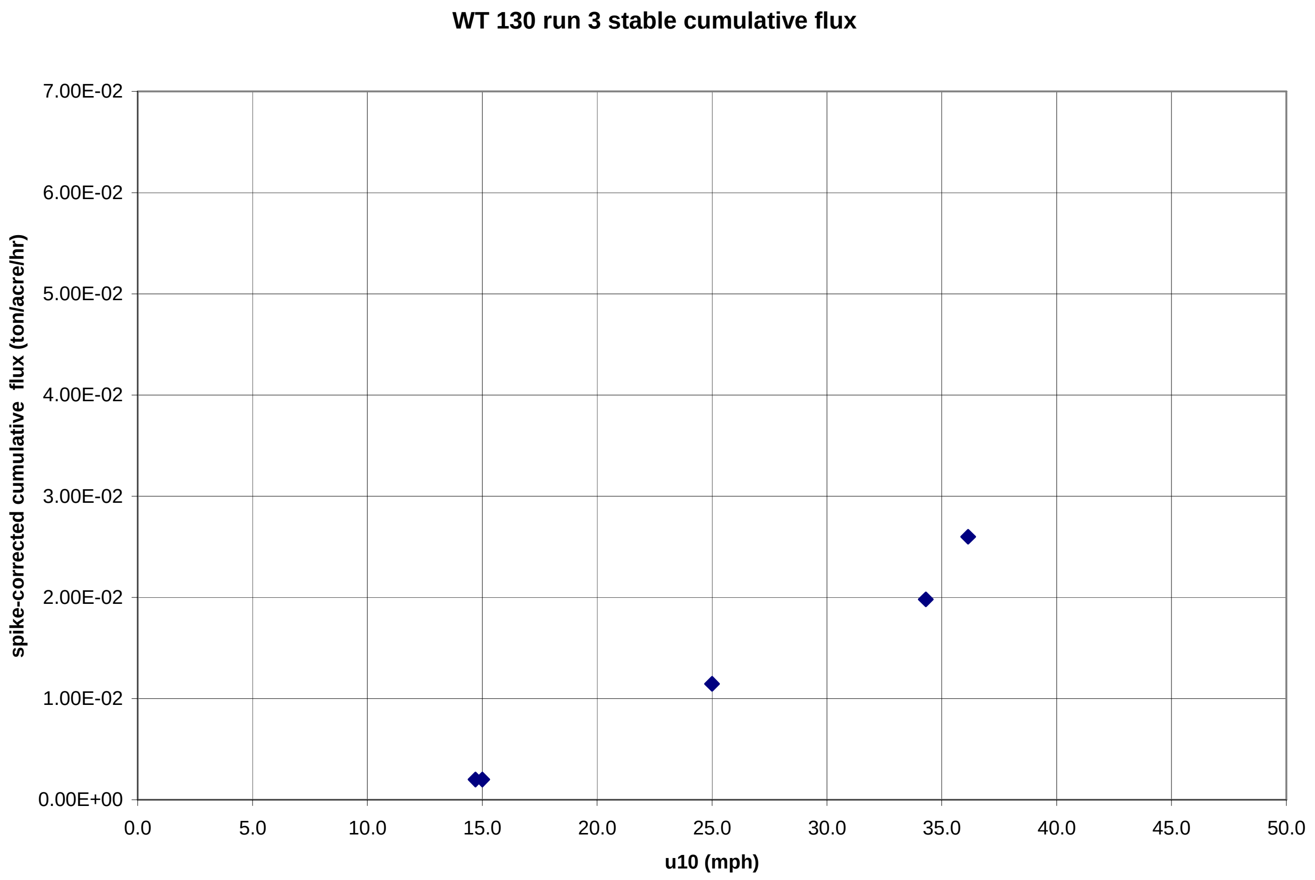
Appendix C (continued)

Figure 109 – U10 versus spike corrected flux – WT 130 2U



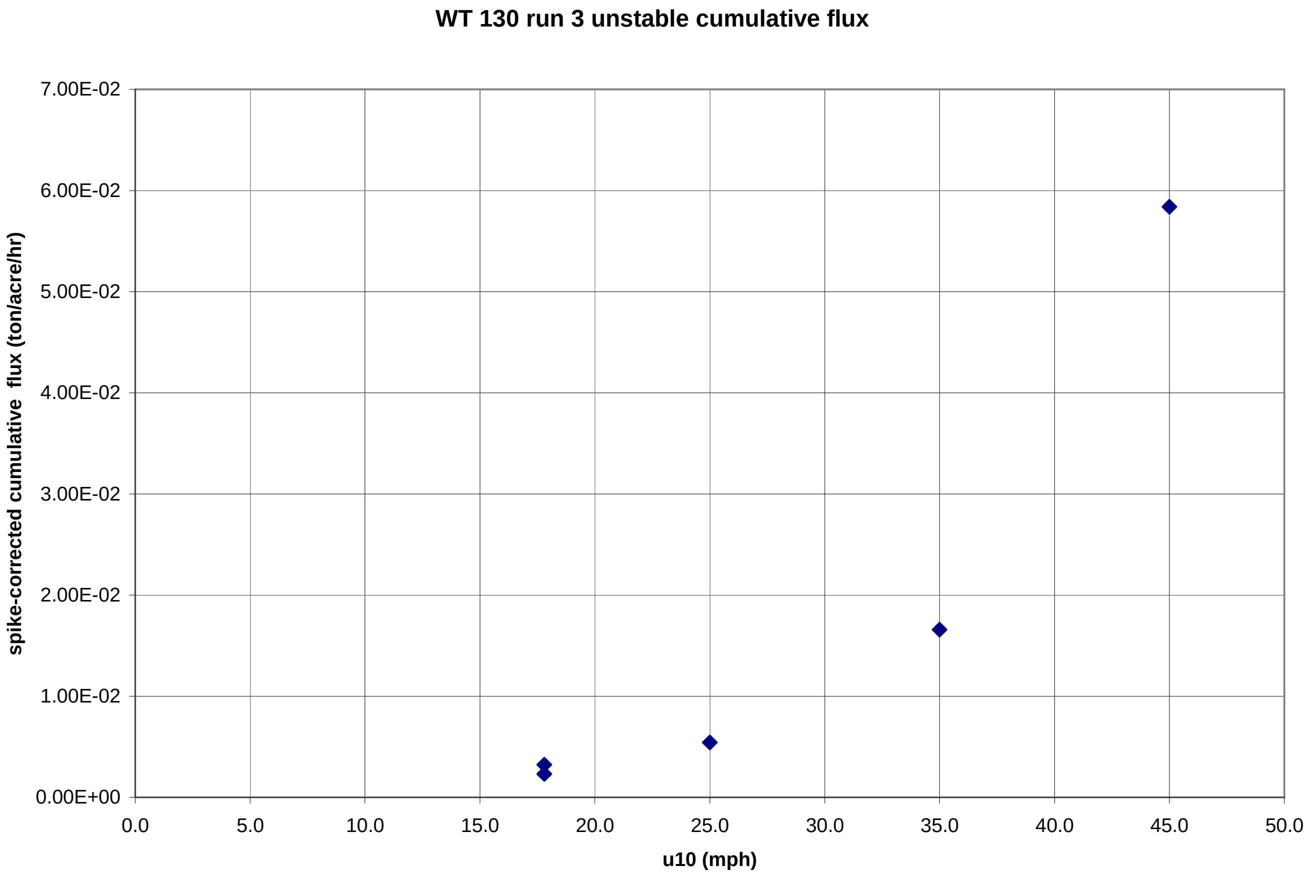
Appendix C (continued)

Figure 110 – U10 versus spike corrected flux – WT 130 3S



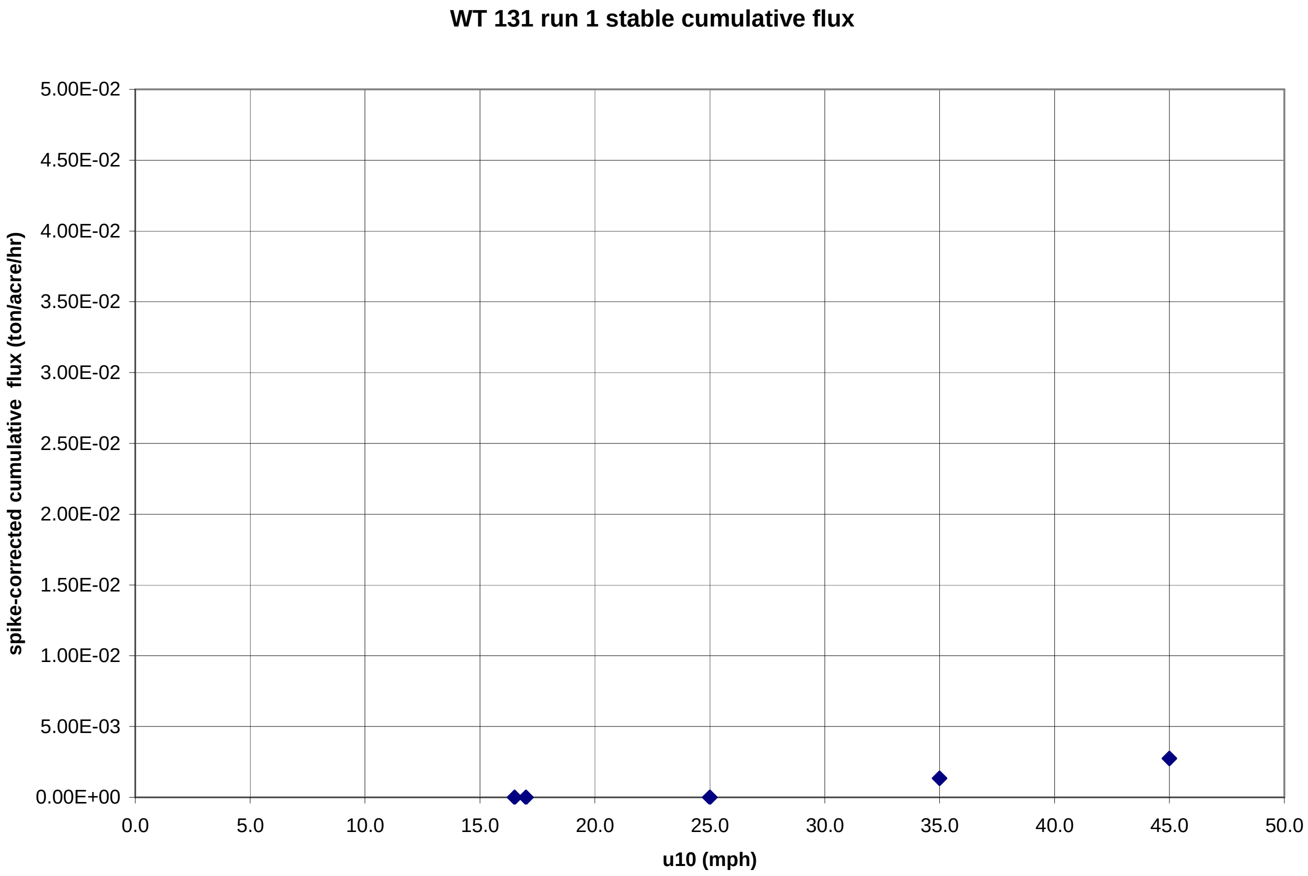
Appendix C (continued)

Figure 111 – U10 versus spike corrected flux – WT 130 3U



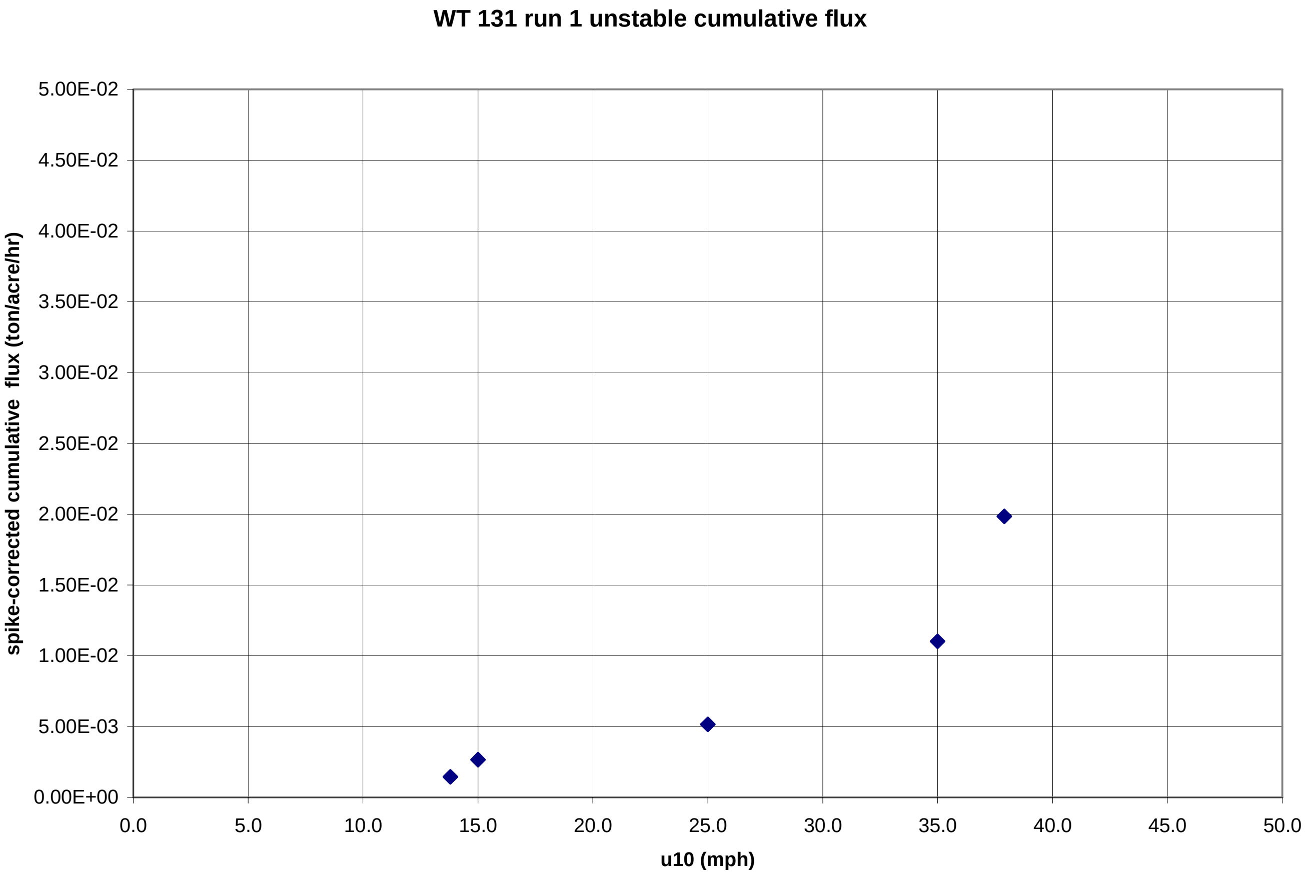
Appendix C (continued)

Figure 112 – U10 versus spike corrected flux – WT 131 1S



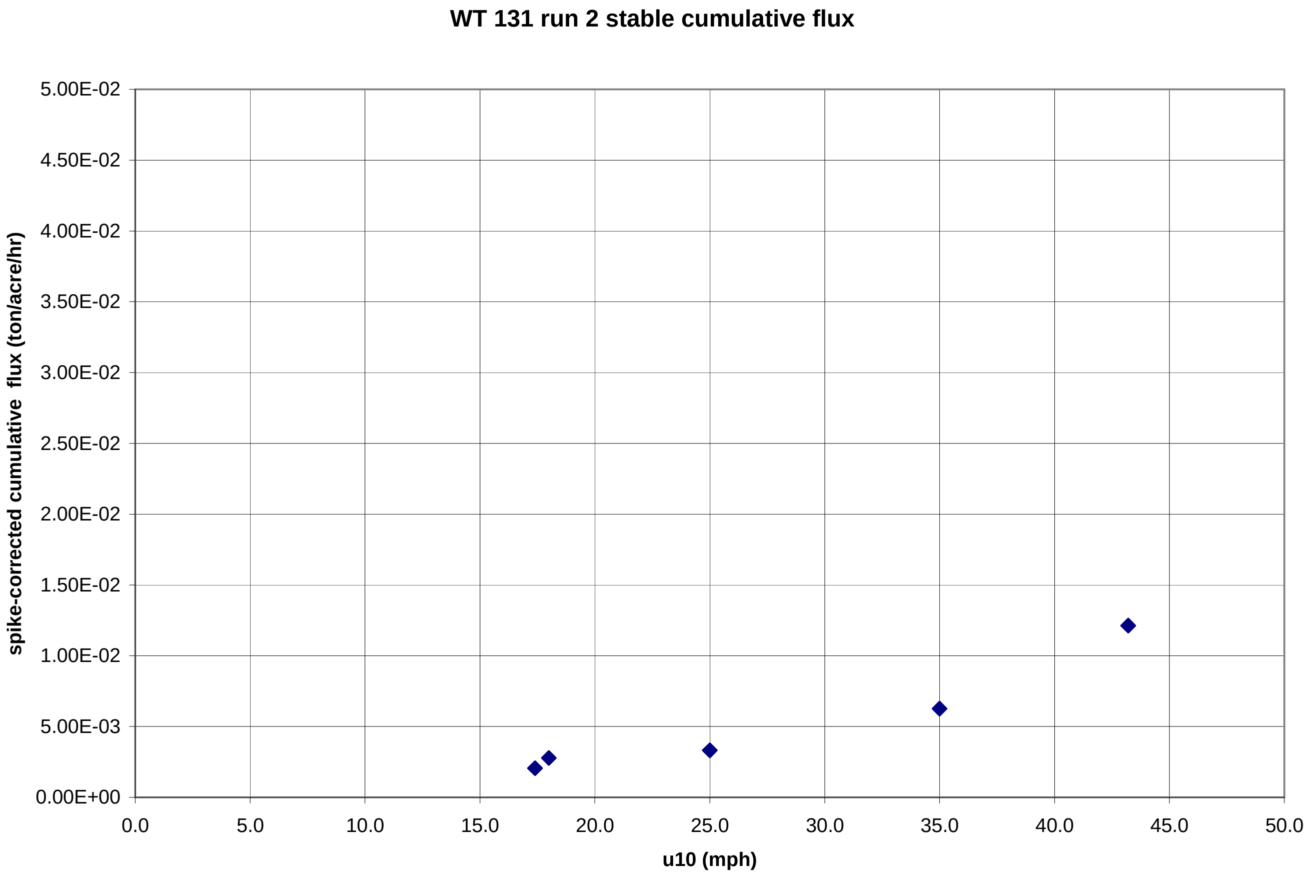
Appendix C (continued)

Figure 113 – U10 versus spike corrected flux – WT 131 1U



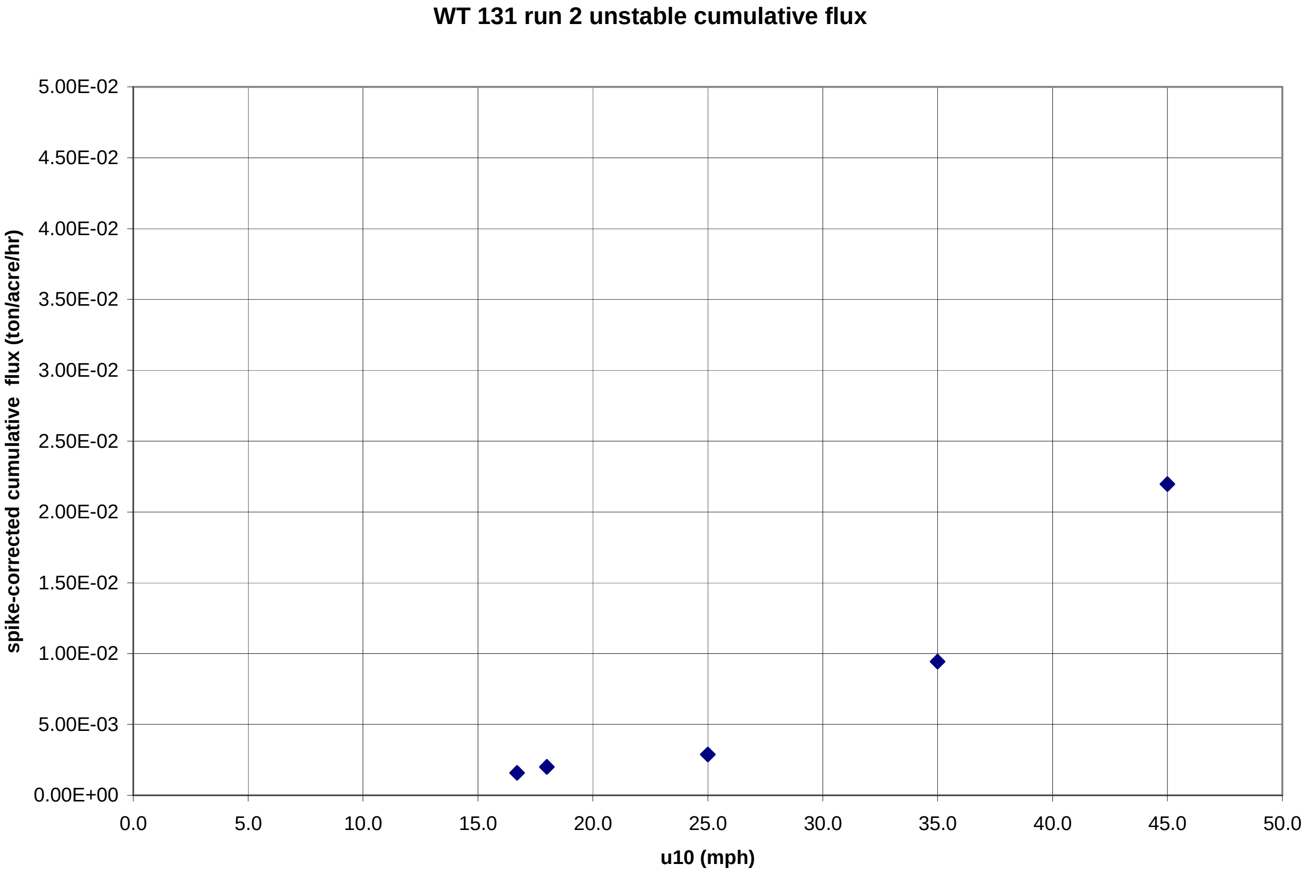
Appendix C (continued)

Figure 114 – U10 versus spike corrected flux – WT 131 2S



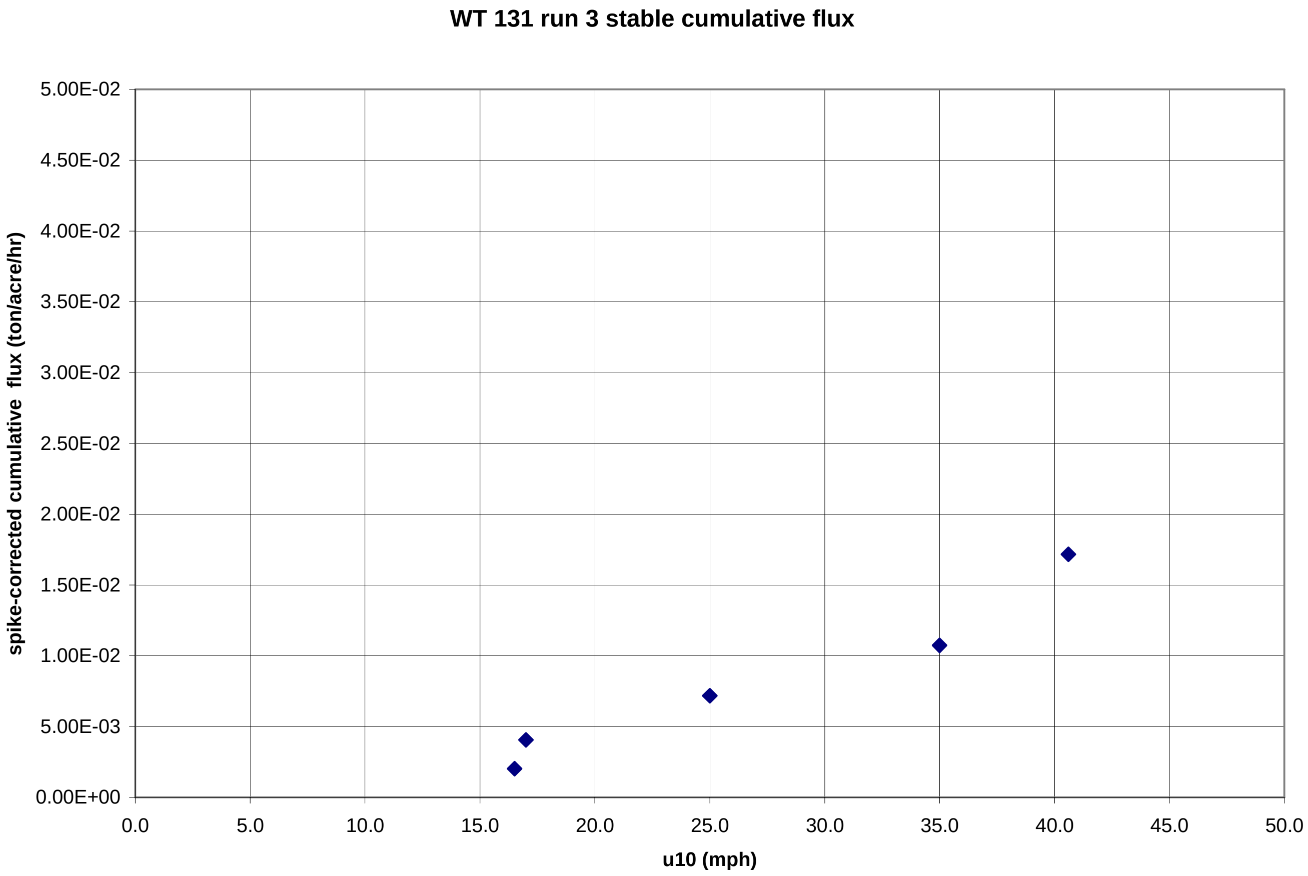
Appendix C (continued)

Figure 115 – U10 versus spike corrected flux – WT 131 2U



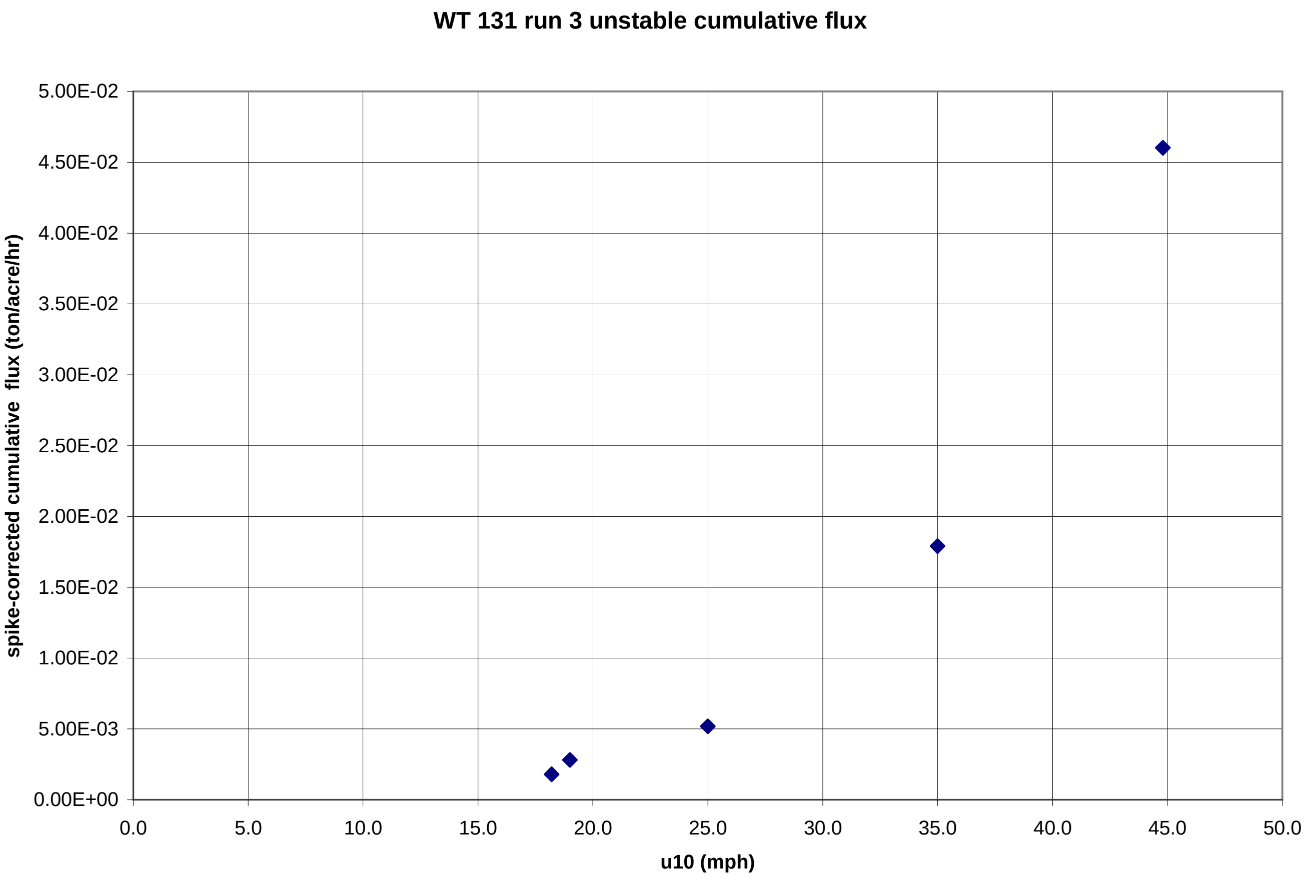
Appendix C (continued)

Figure 116 – U10 versus spike corrected flux – WT 131 3S



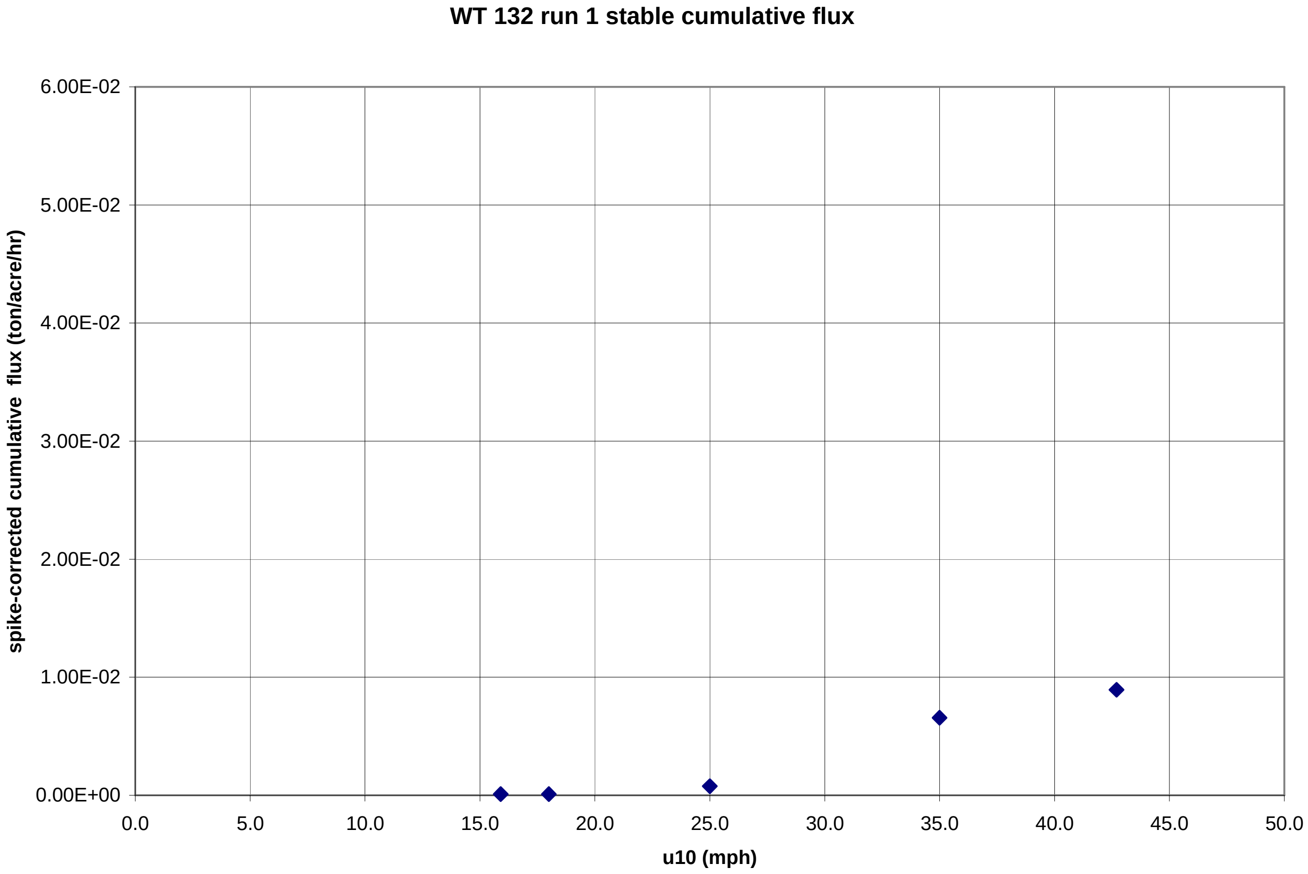
Appendix C (continued)

Figure 117 – U10 versus spike corrected flux – WT 131 3U



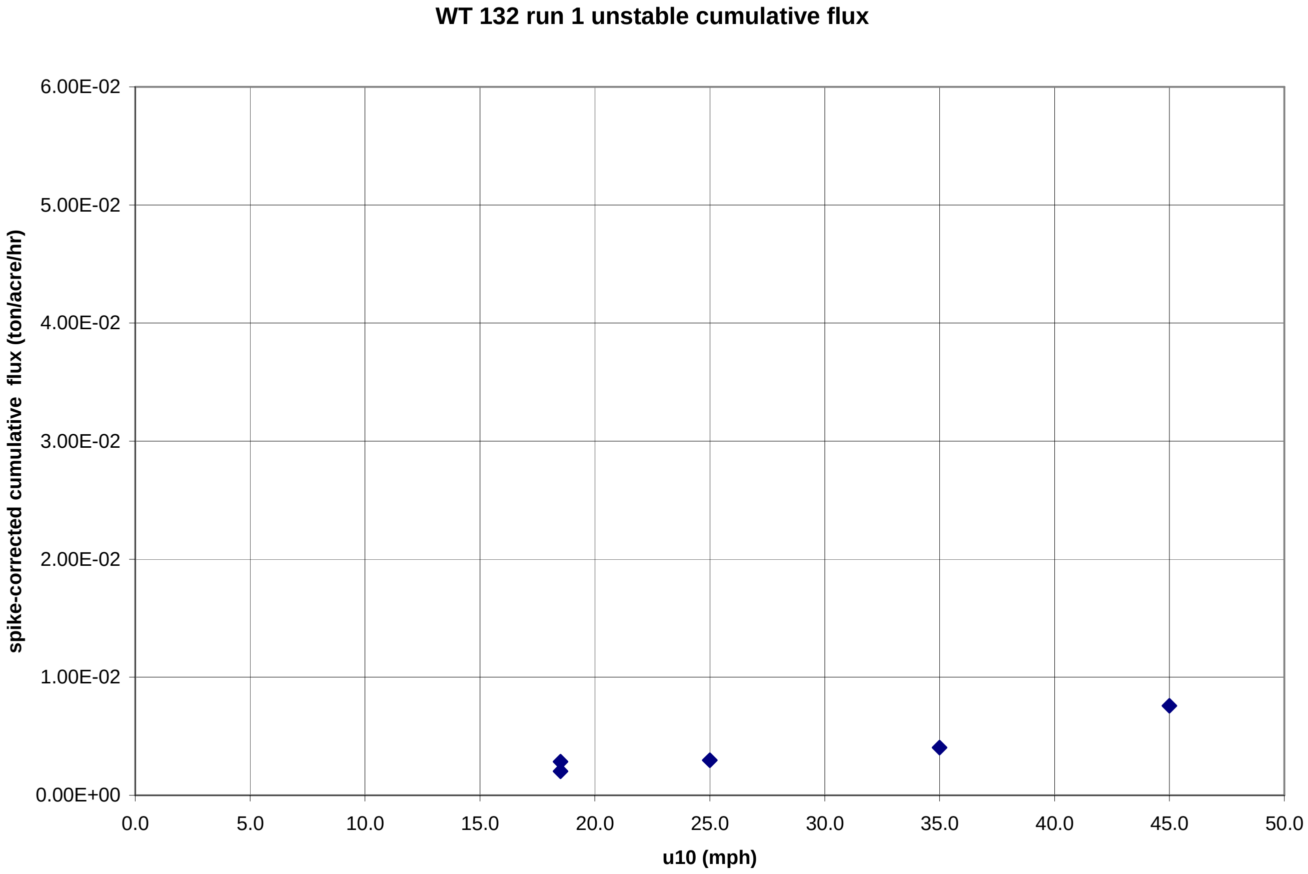
Appendix C (continued)

Figure 118 – U10 versus spike corrected flux – WT 132 1S



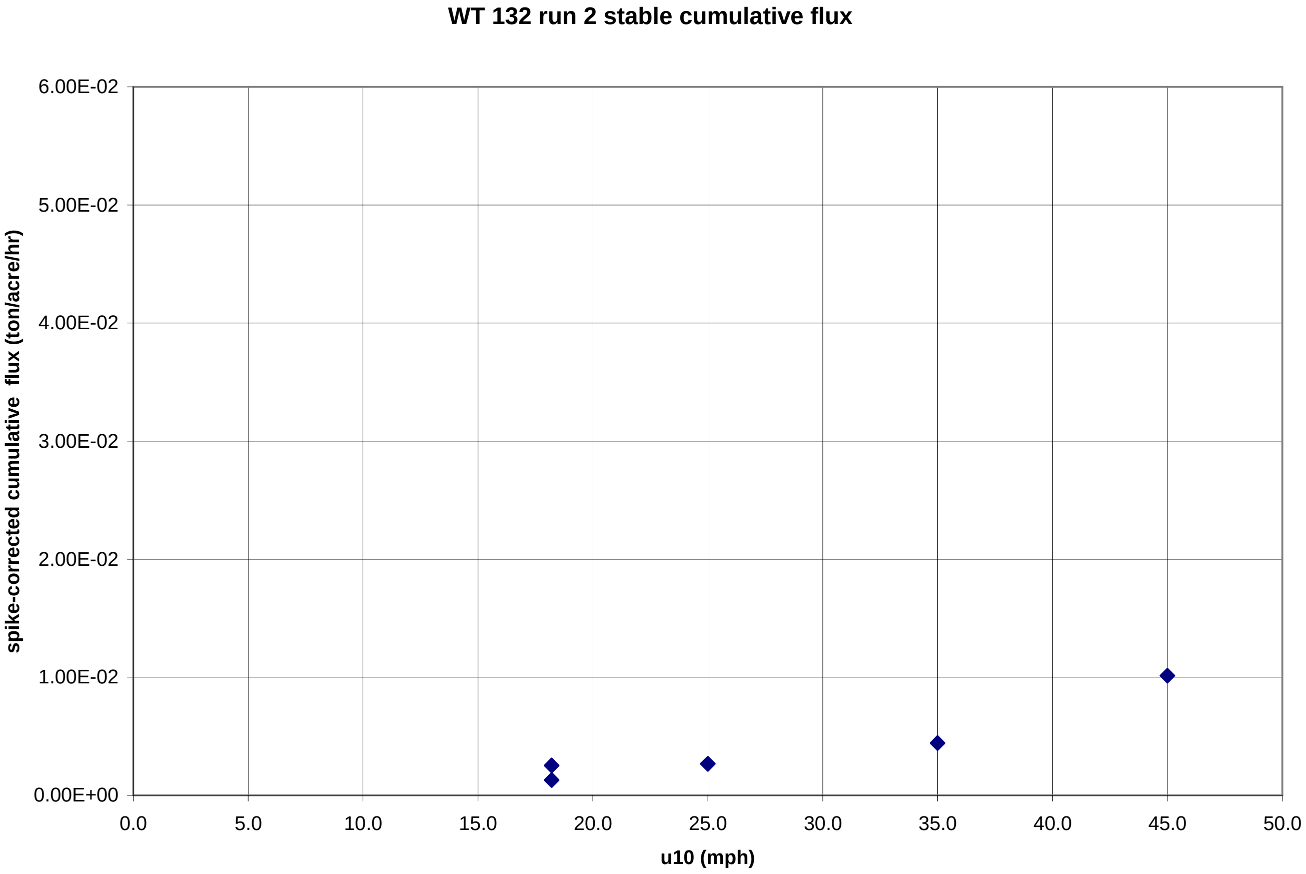
Appendix C (continued)

Figure 119 – U10 versus spike corrected flux – WT 132 1U



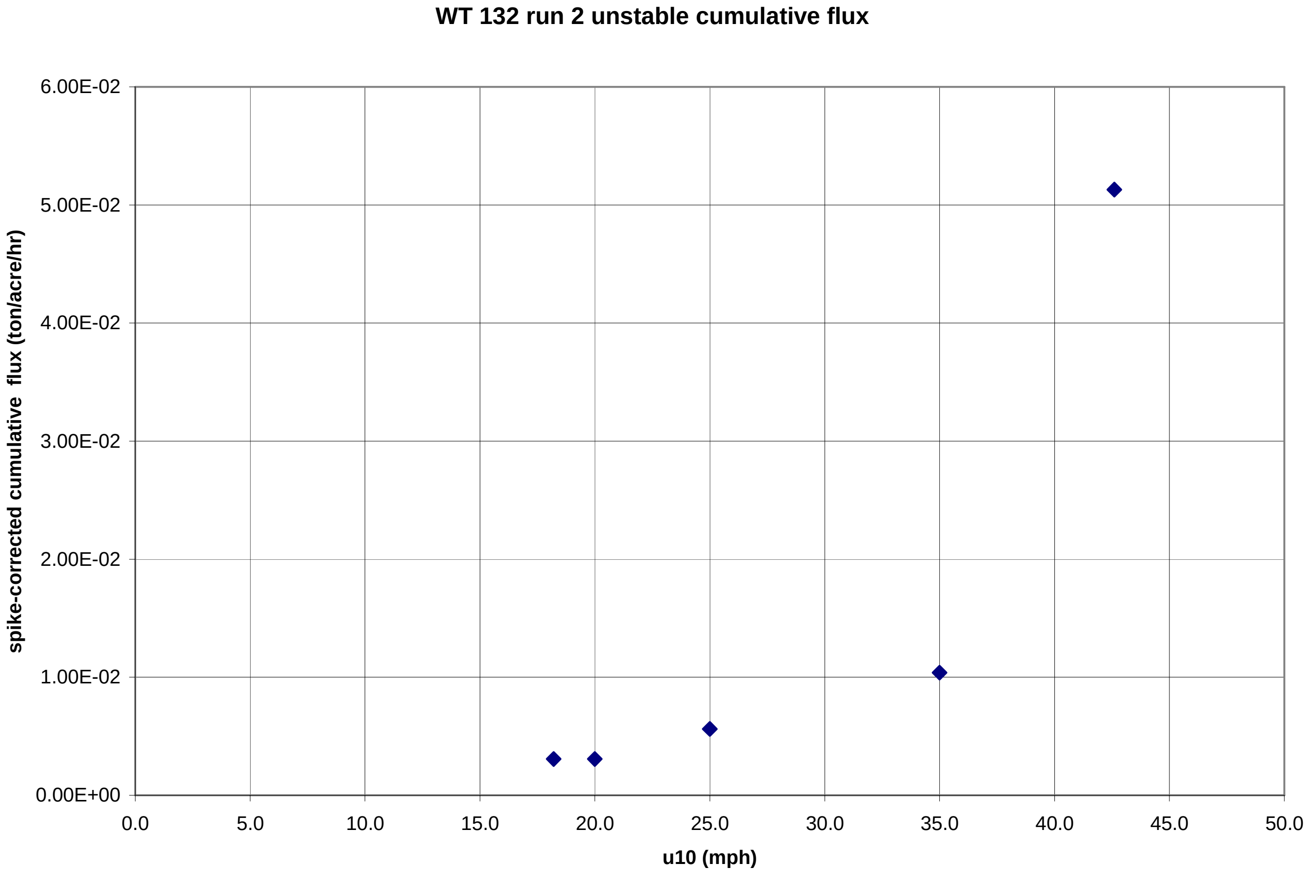
Appendix C (continued)

Figure 120 – U10 versus spike corrected flux – WT 132 2S



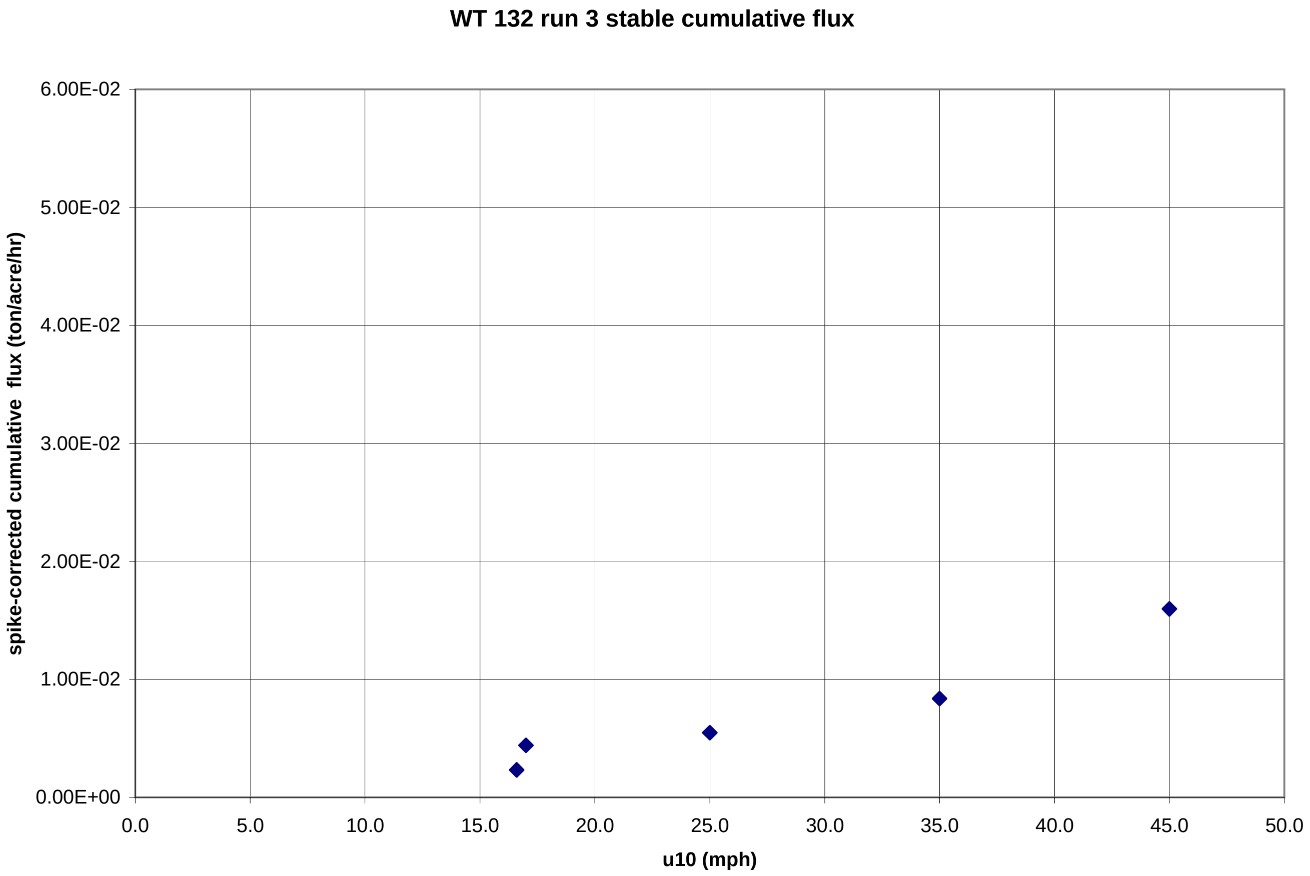
Appendix C (continued)

Figure 121 – U10 versus spike corrected flux – WT 132 2U



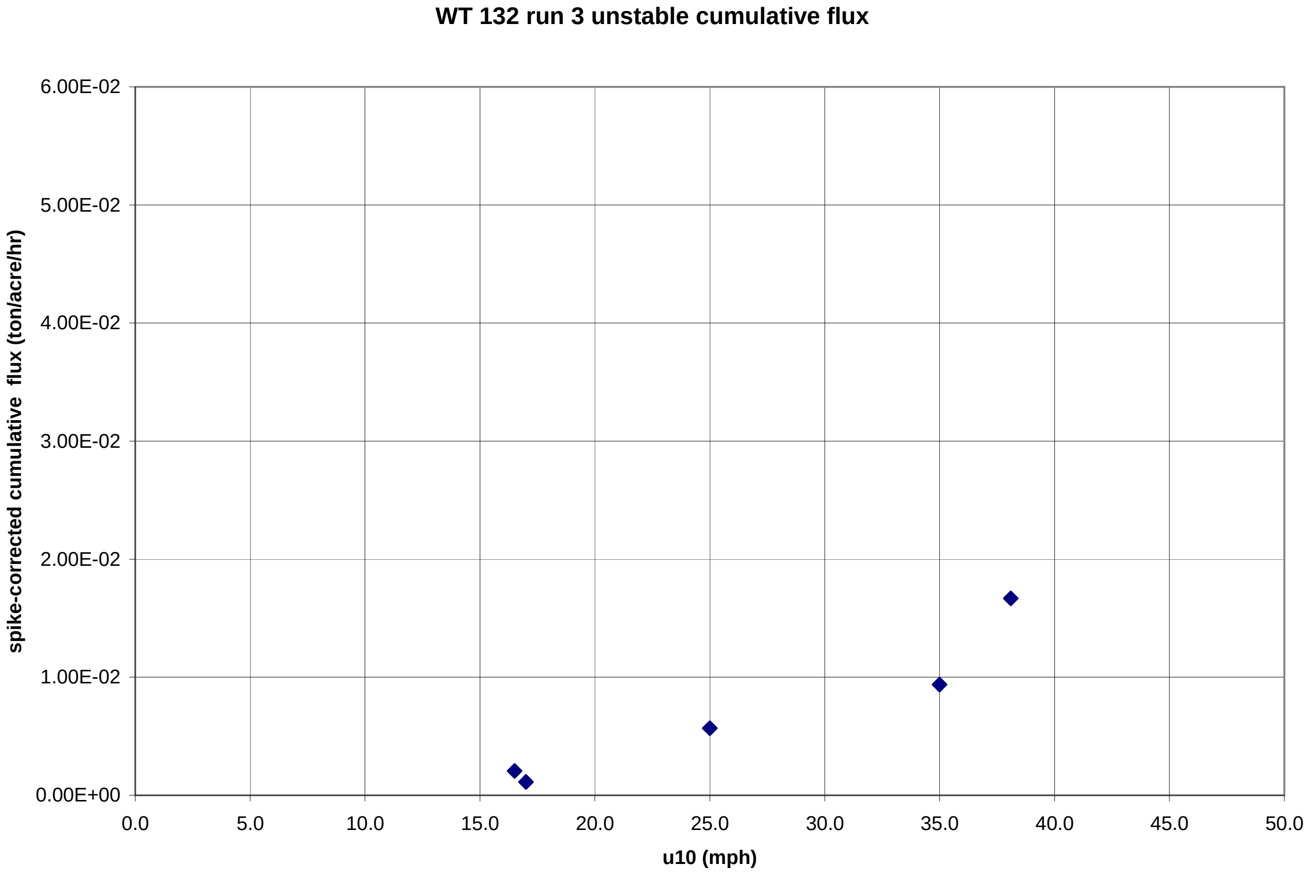
Appendix C (continued)

Figure 122 – U10 versus spike corrected flux – WT 132 3S



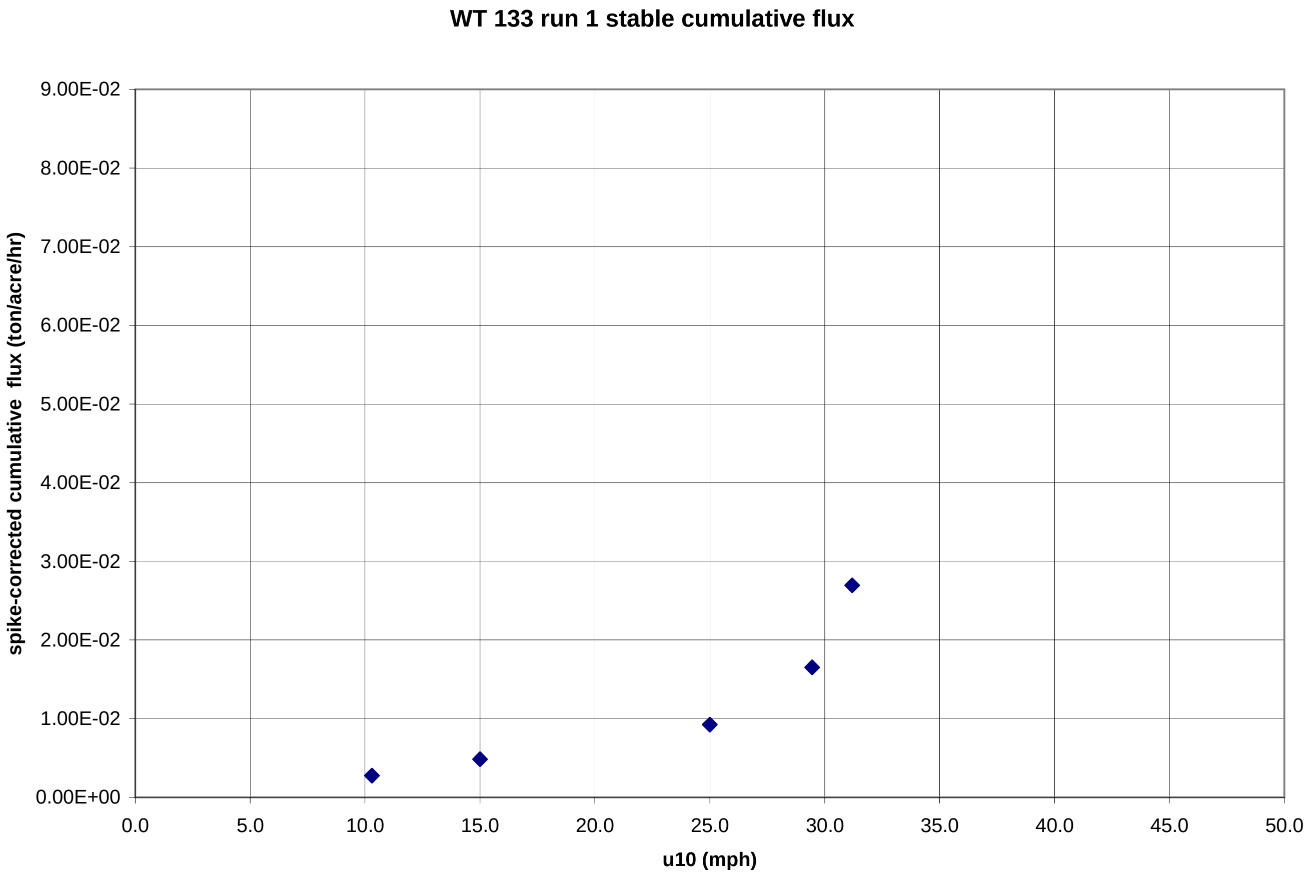
Appendix C (continued)

Figure 123 – U10 versus spike corrected flux – WT 132 3U



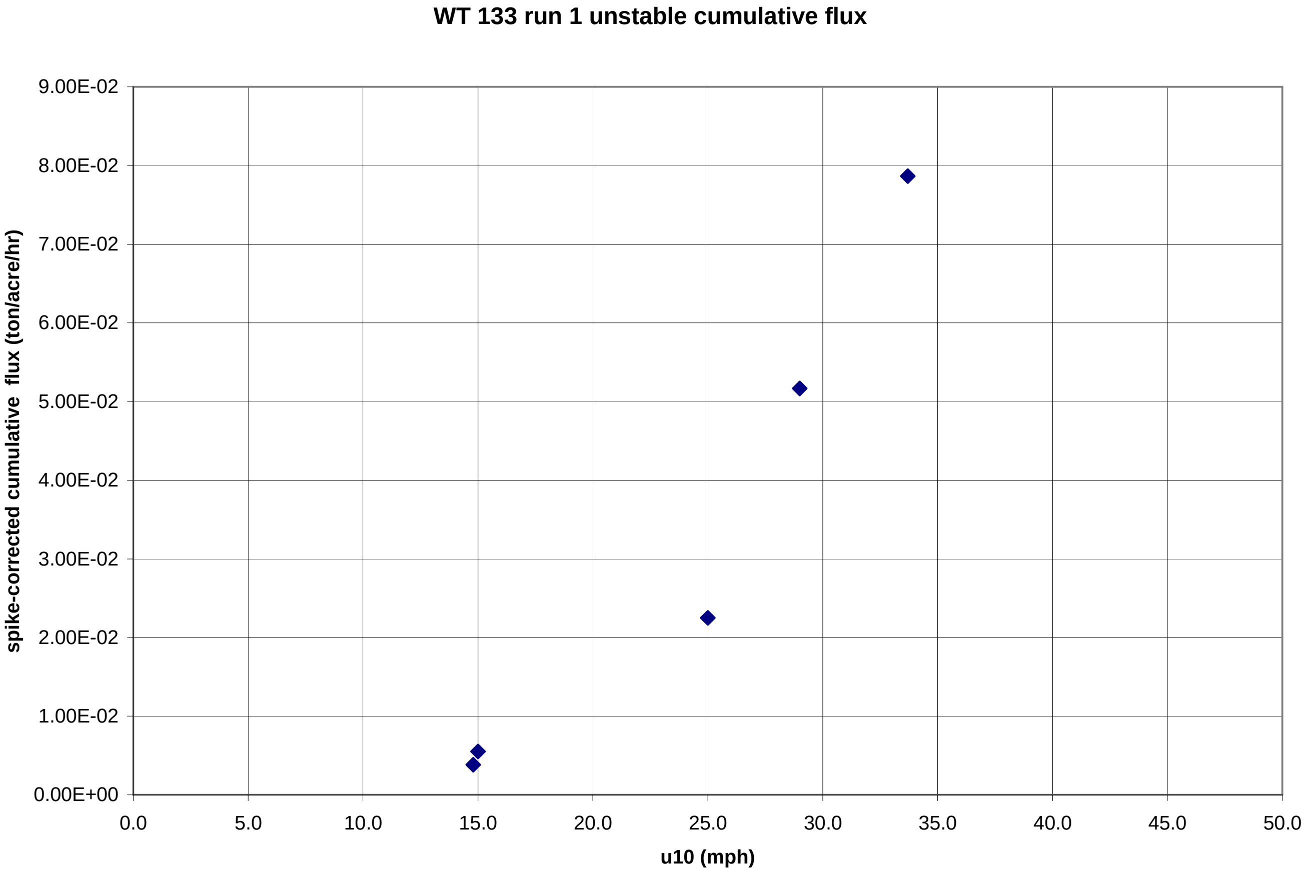
Appendix C (continued)

Figure 124 – U10 versus spike corrected flux – WT 133 1S



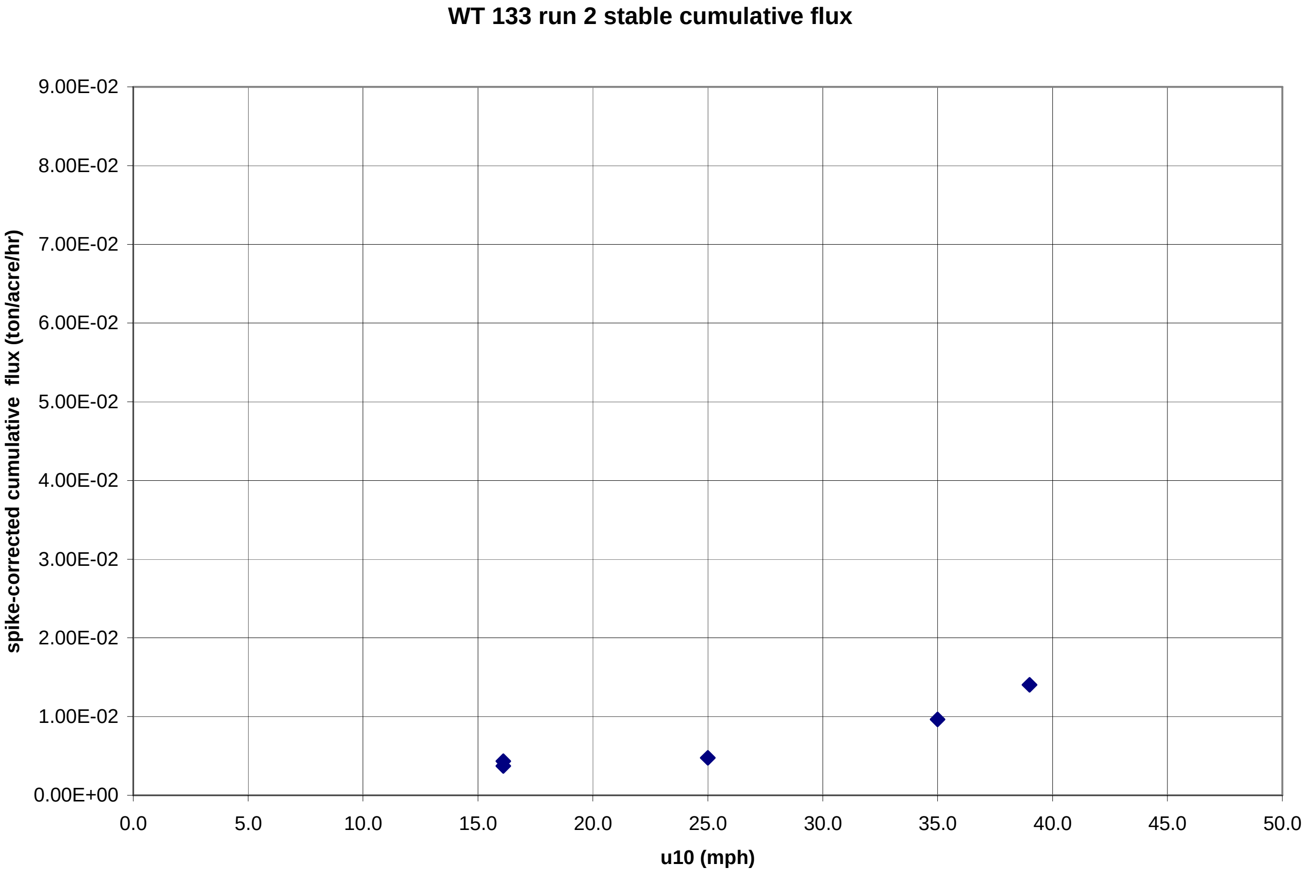
Appendix C (continued)

Figure 125 – U10 versus spike corrected flux – WT 133 1U



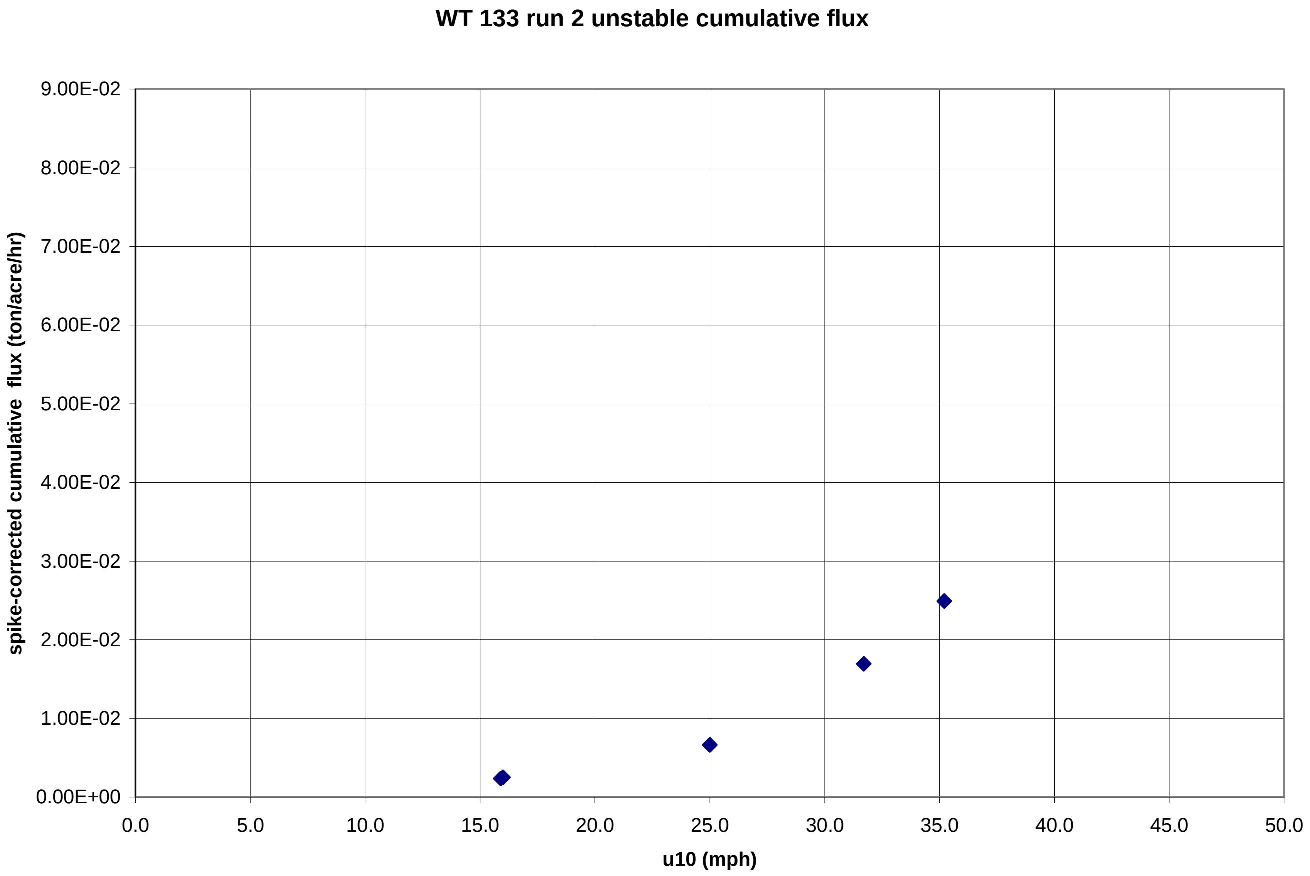
Appendix C (continued)

Figure 126 – U10 versus spike corrected flux – WT 133 2S



Appendix C (continued)

Figure 127 – U10 versus spike corrected flux – WT 133 2U



Appendix C (continued)

Figure 128 – U10 versus spike corrected flux – WT 133 3S

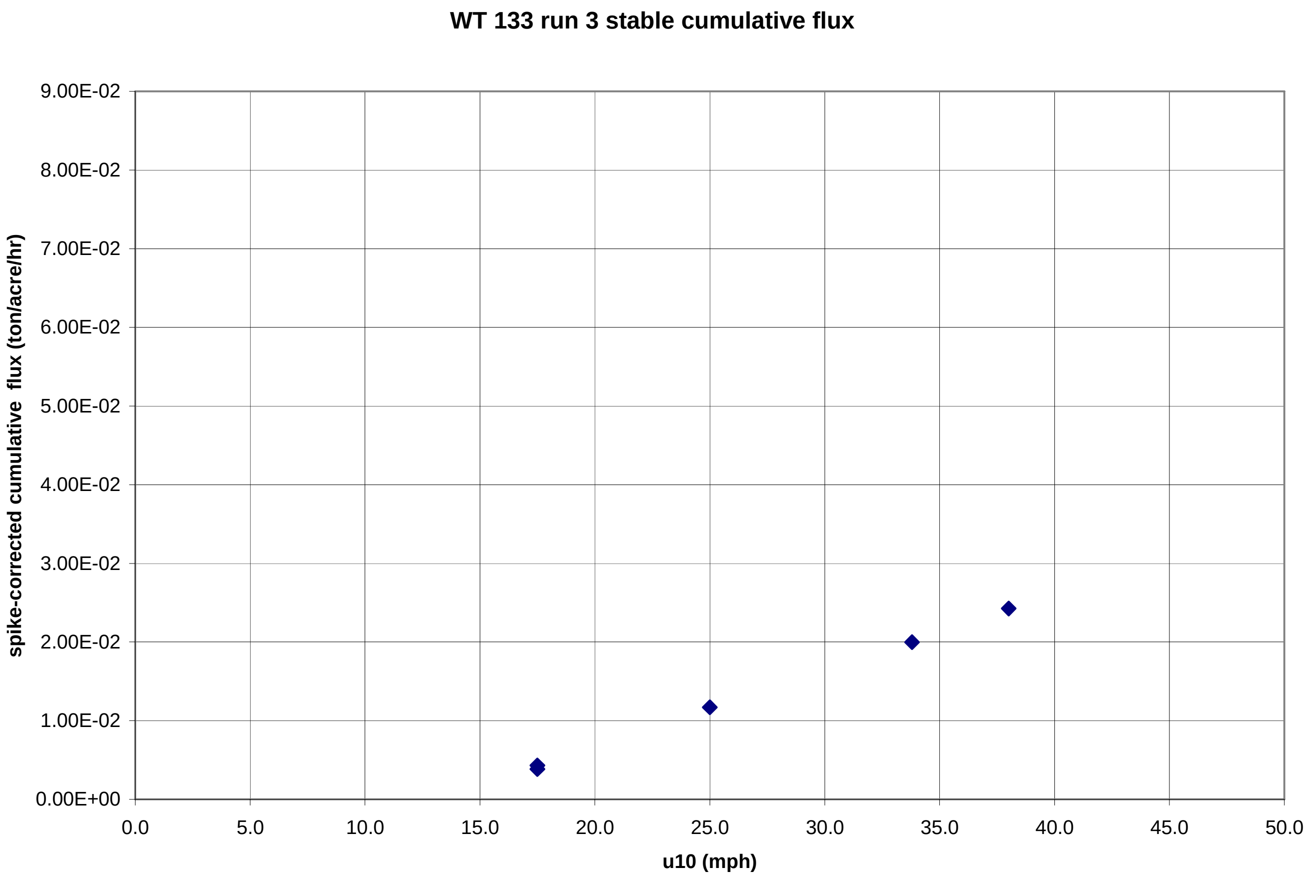
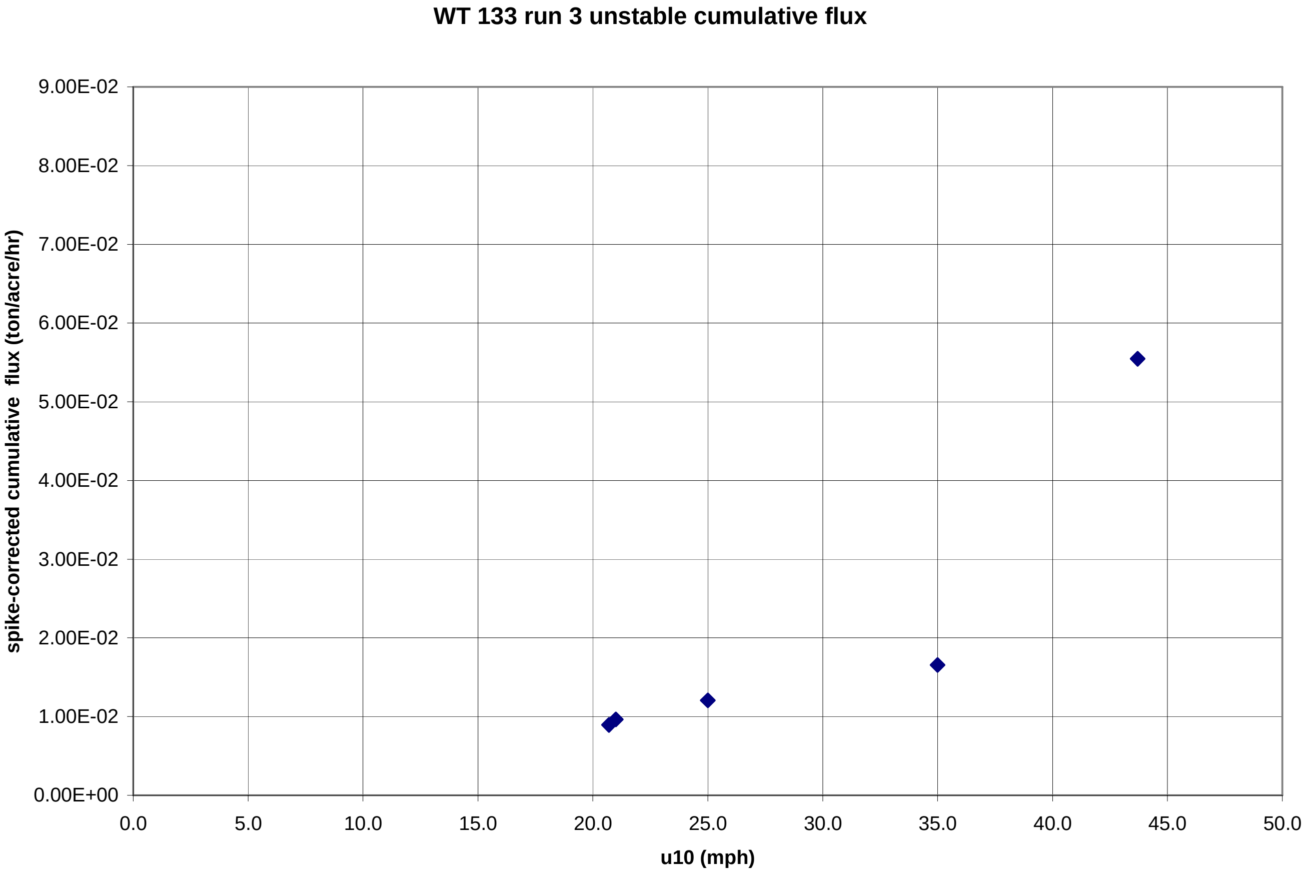
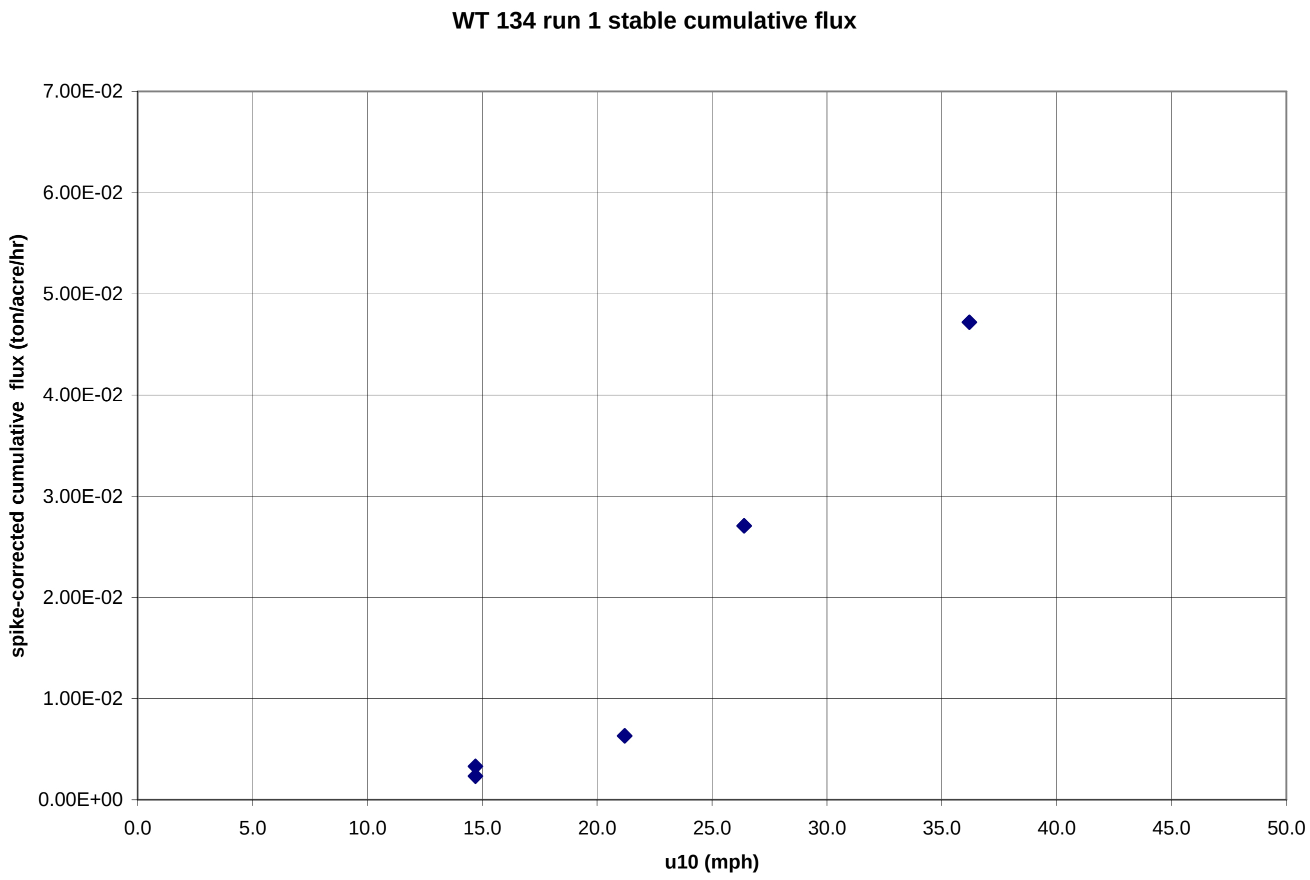


Figure 129 – U10 versus spike corrected flux – WT 133 3U



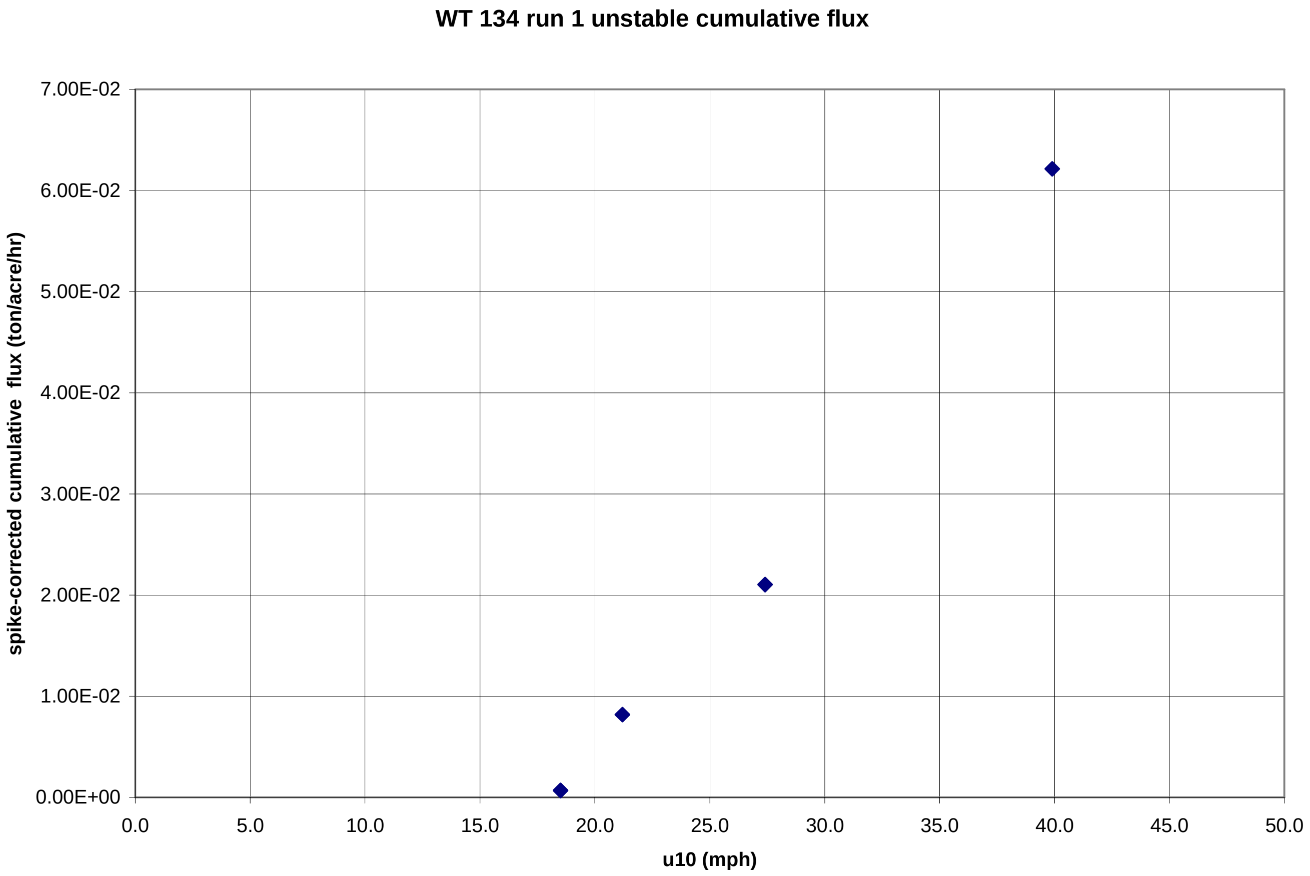
Appendix C (continued)

Figure 130 – U10 versus spike corrected flux – WT 134 1S



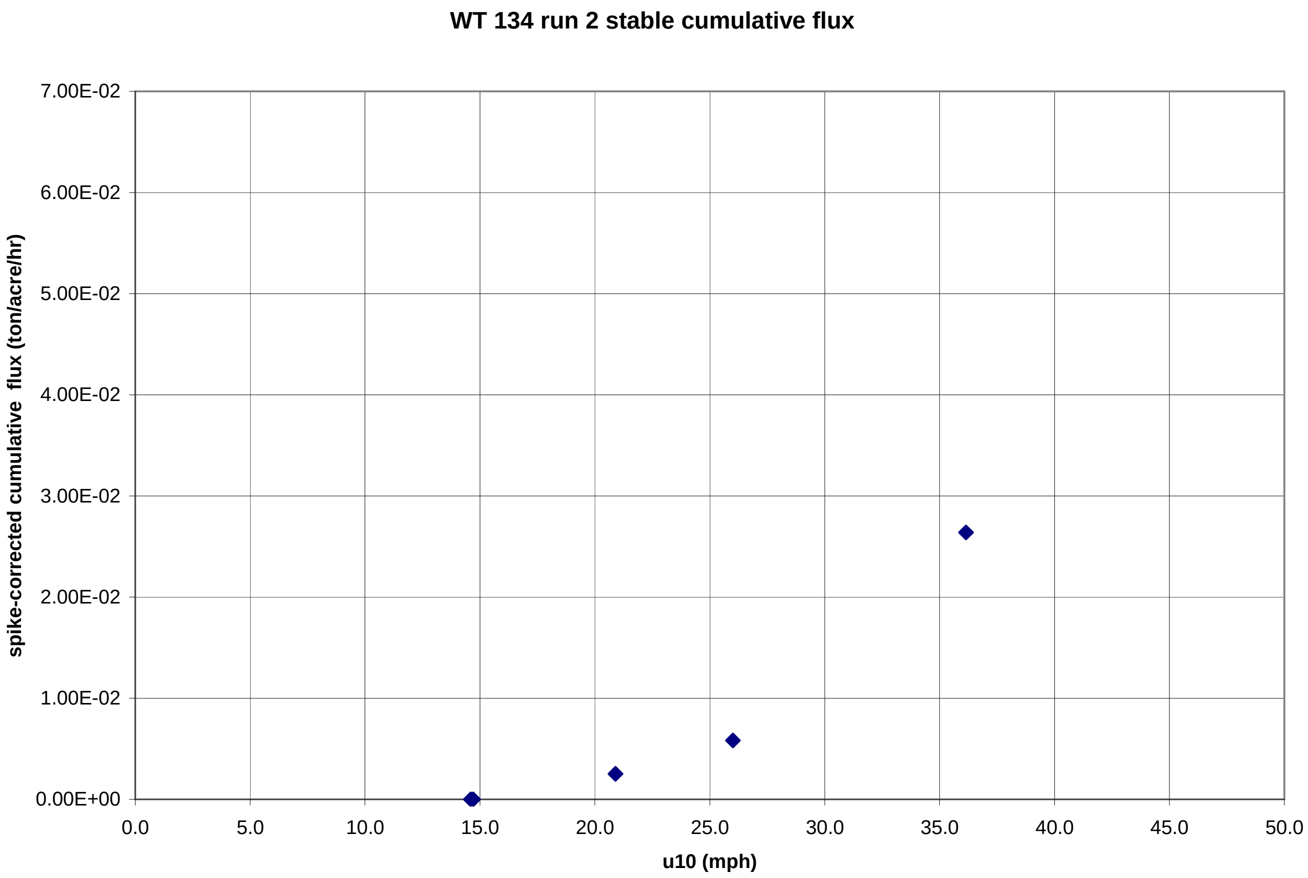
Appendix C (continued)

Figure 131 – U10 versus spike corrected flux – WT 134 1U



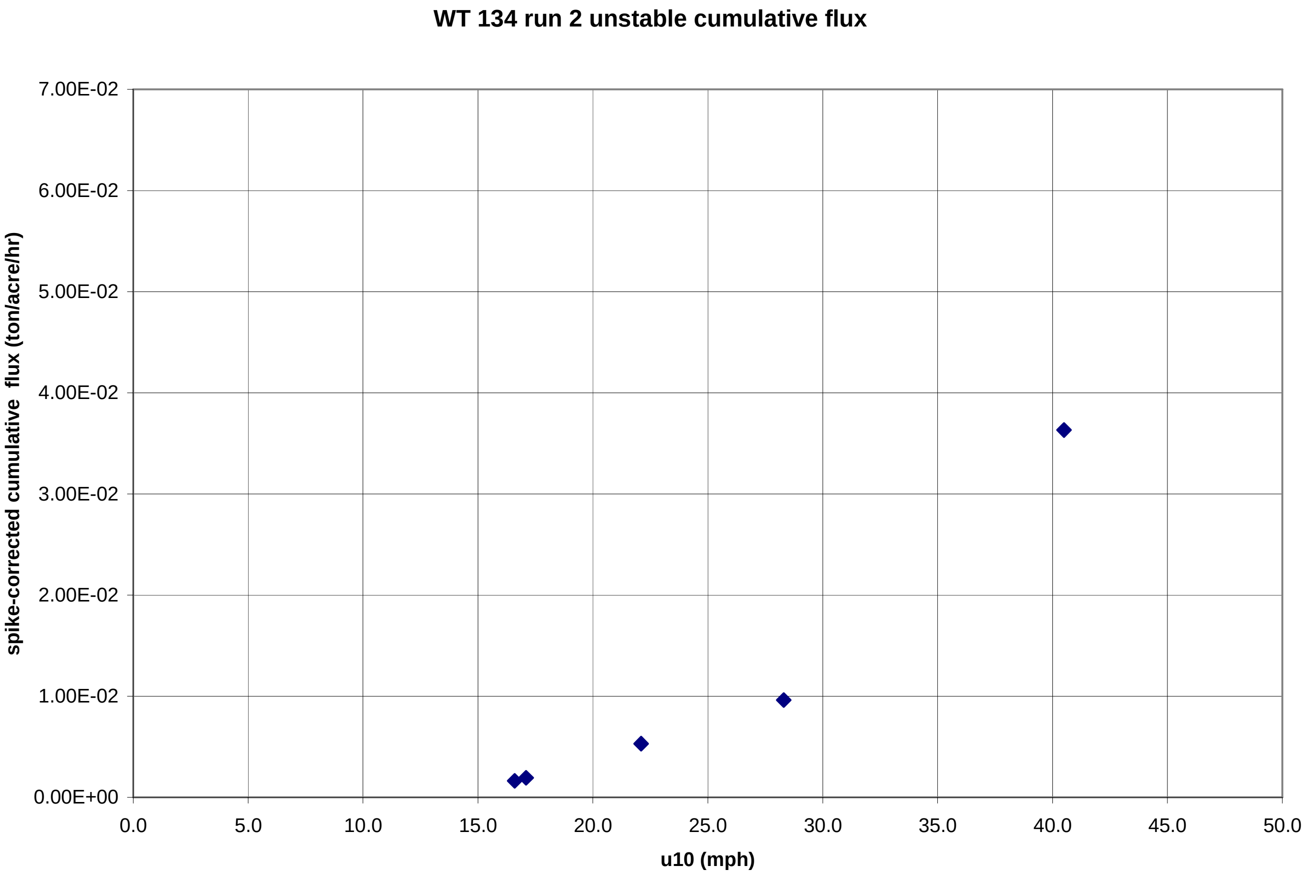
Appendix C (continued)

Figure 132 – U10 versus spike corrected flux – WT 134 2S



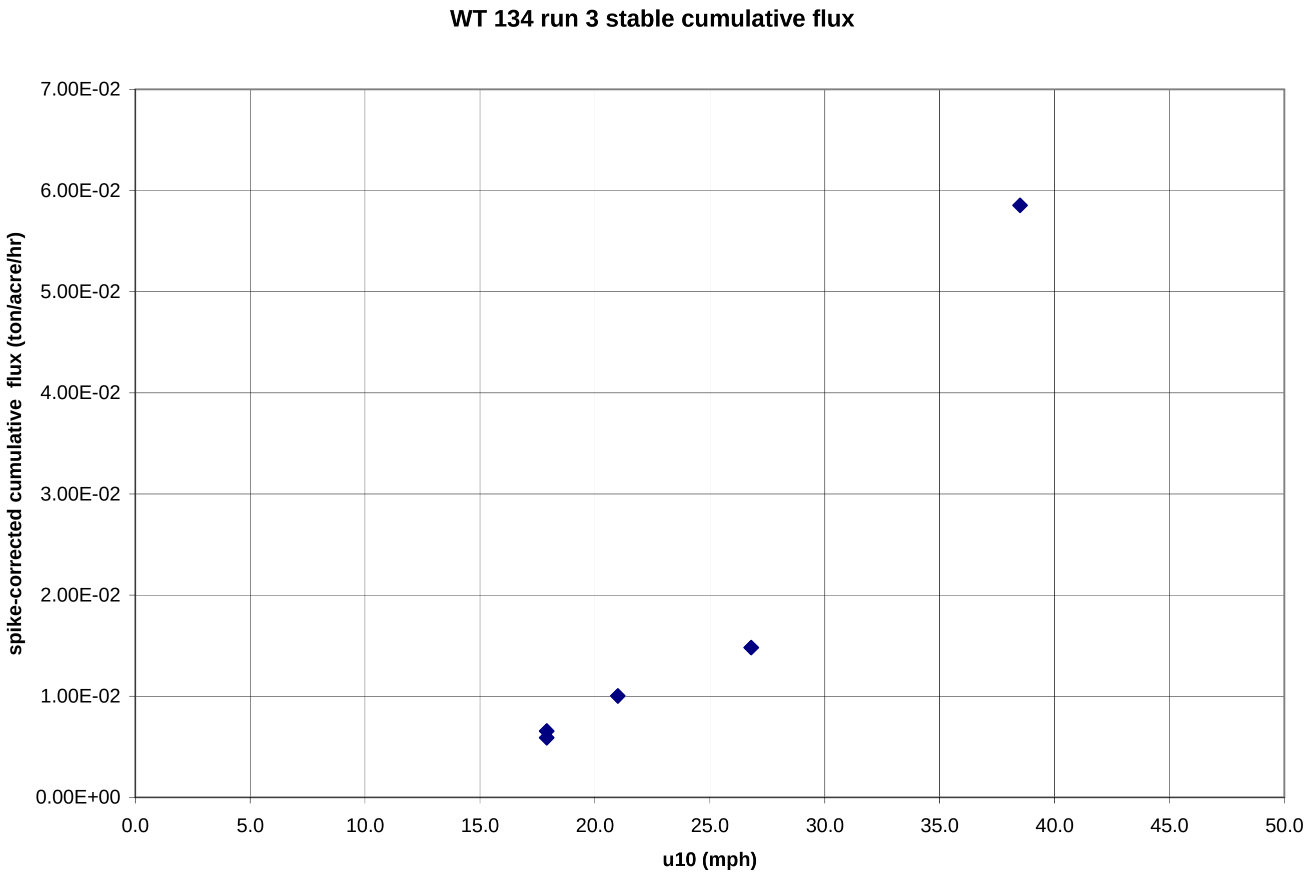
Appendix C (continued)

Figure 133 – U10 versus spike corrected flux – WT 134 2U



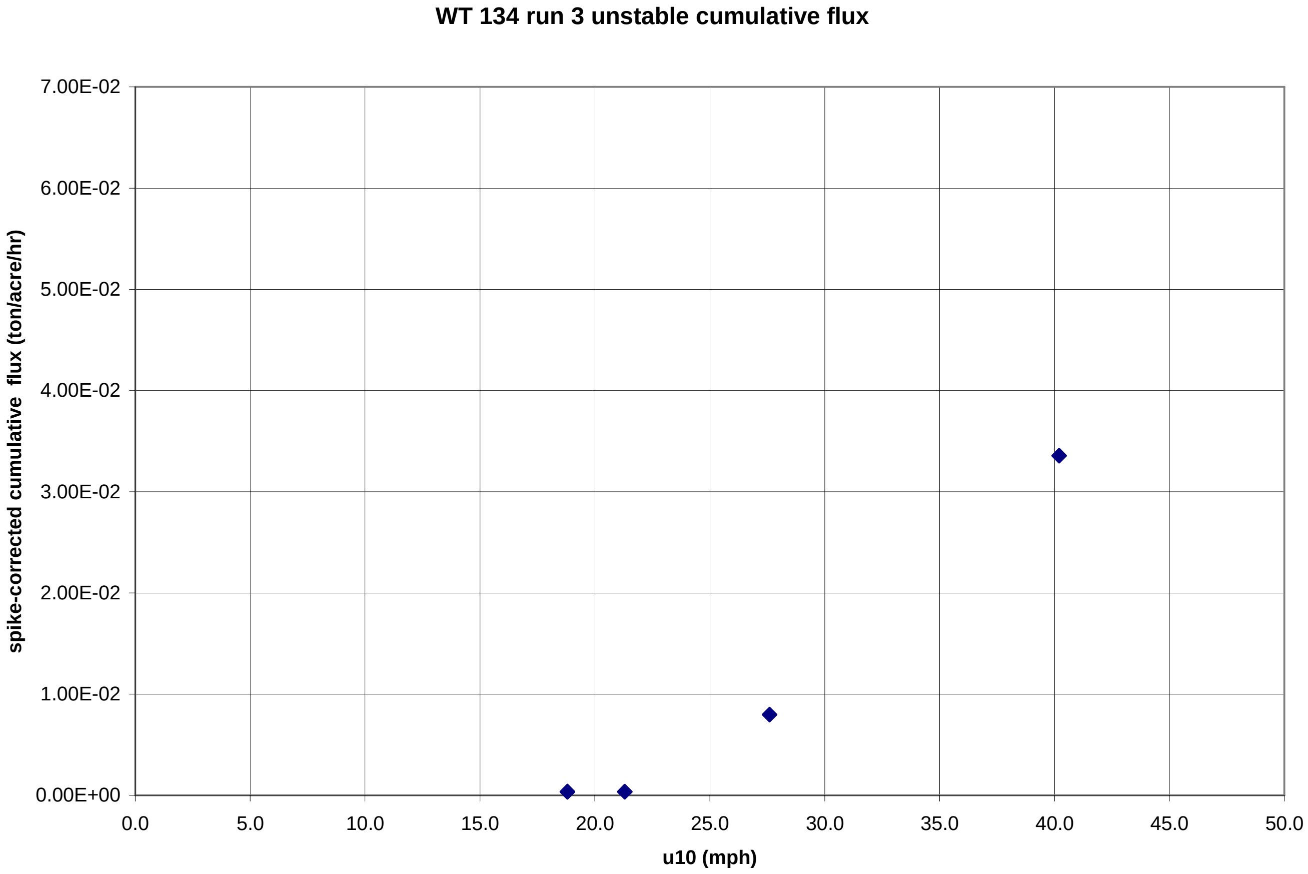
Appendix C (continued)

Figure 134 – U10 versus spike corrected flux – WT 134 3S



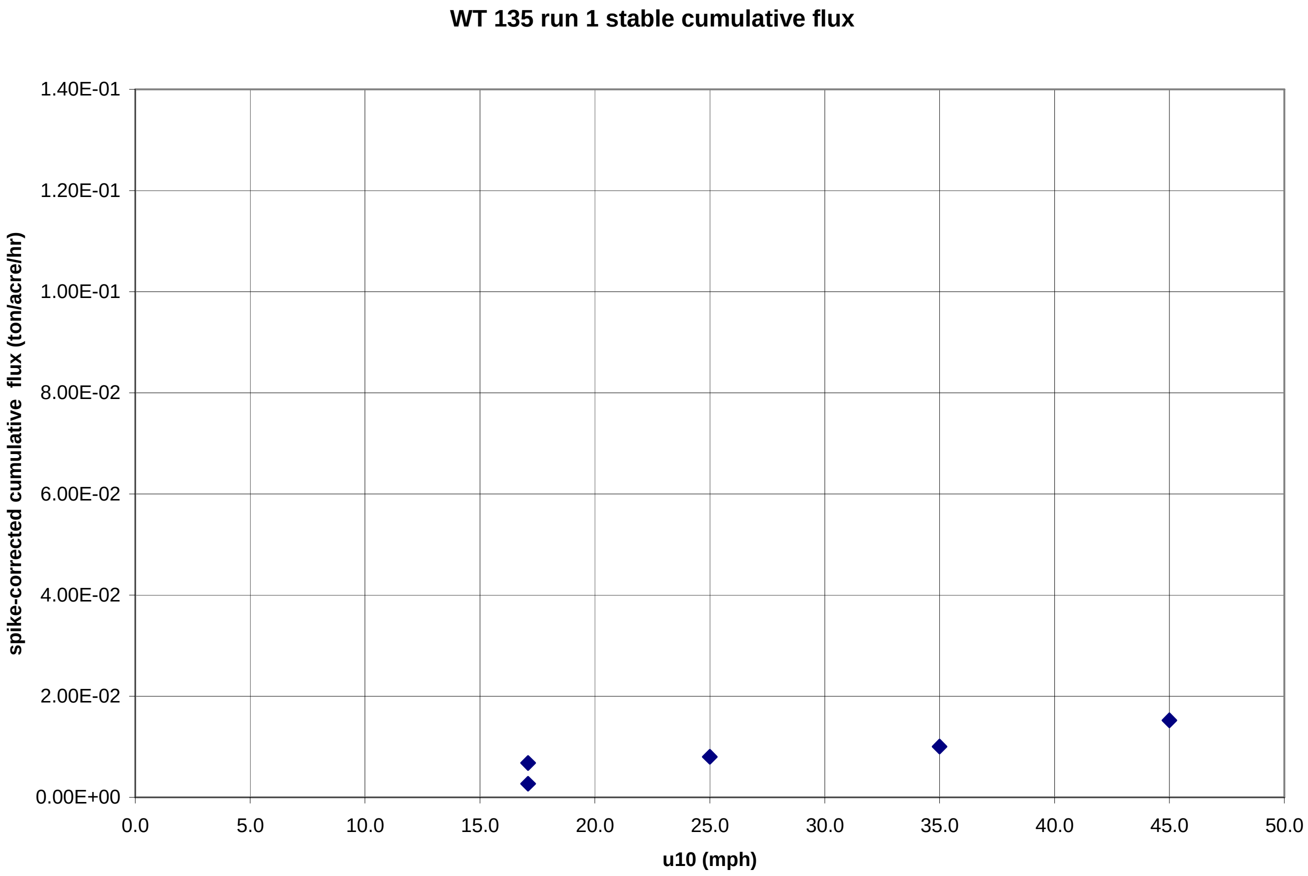
Appendix C (continued)

Figure 135 – U10 versus spike corrected flux – WT 134 3U



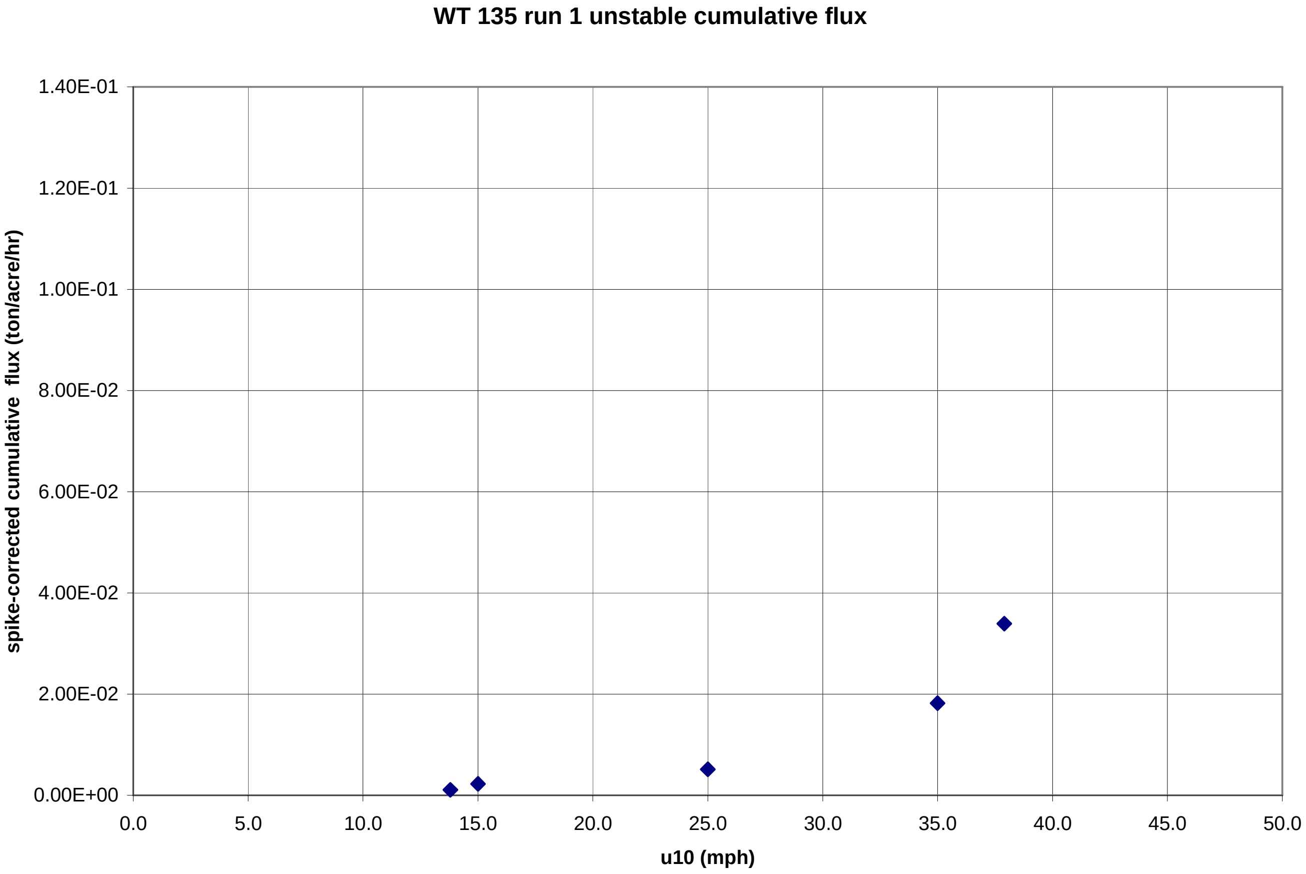
Appendix C (continued)

Figure 136 – U10 versus spike corrected flux – WT 135 1S



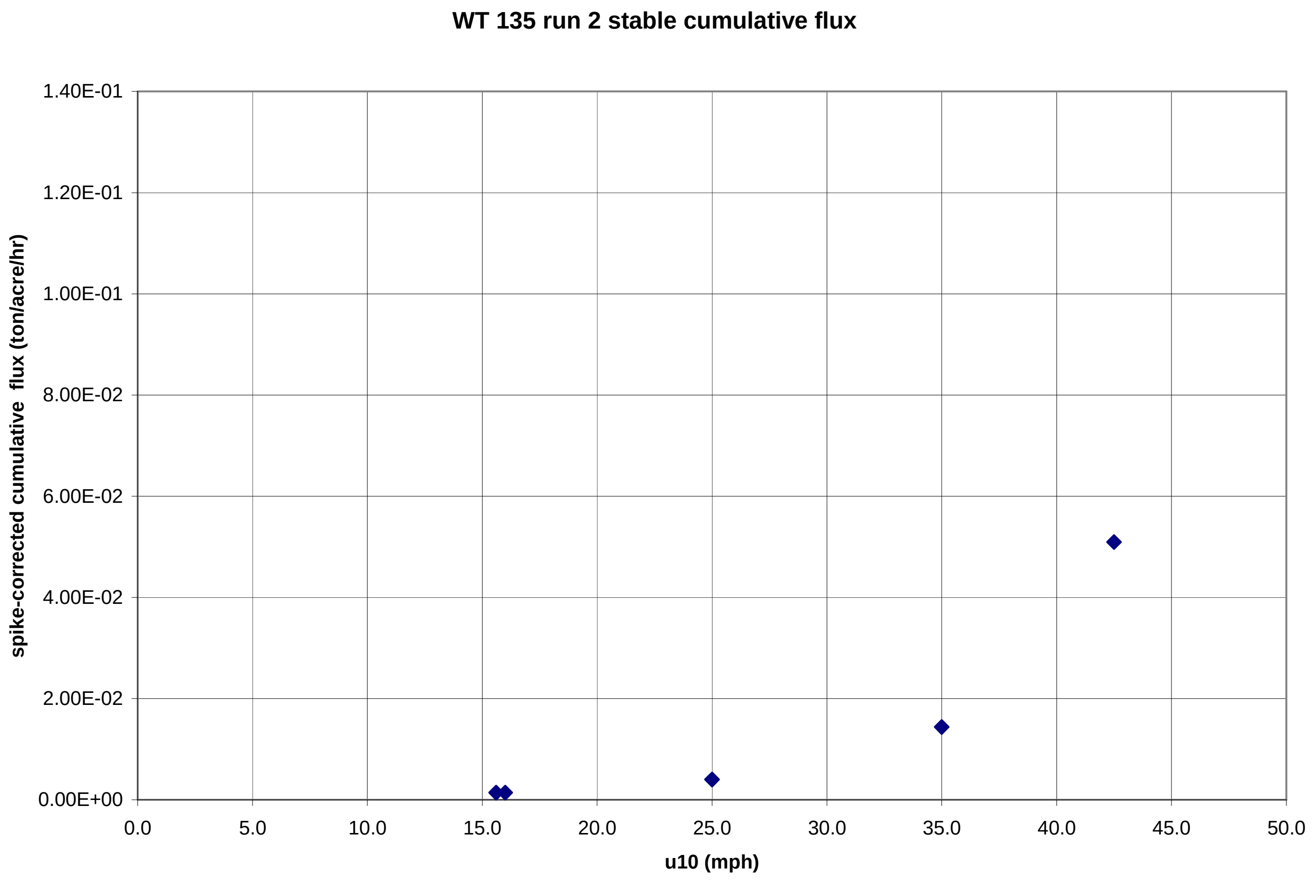
Appendix C (continued)

Figure 137 – U10 versus spike corrected flux – WT 135 1U



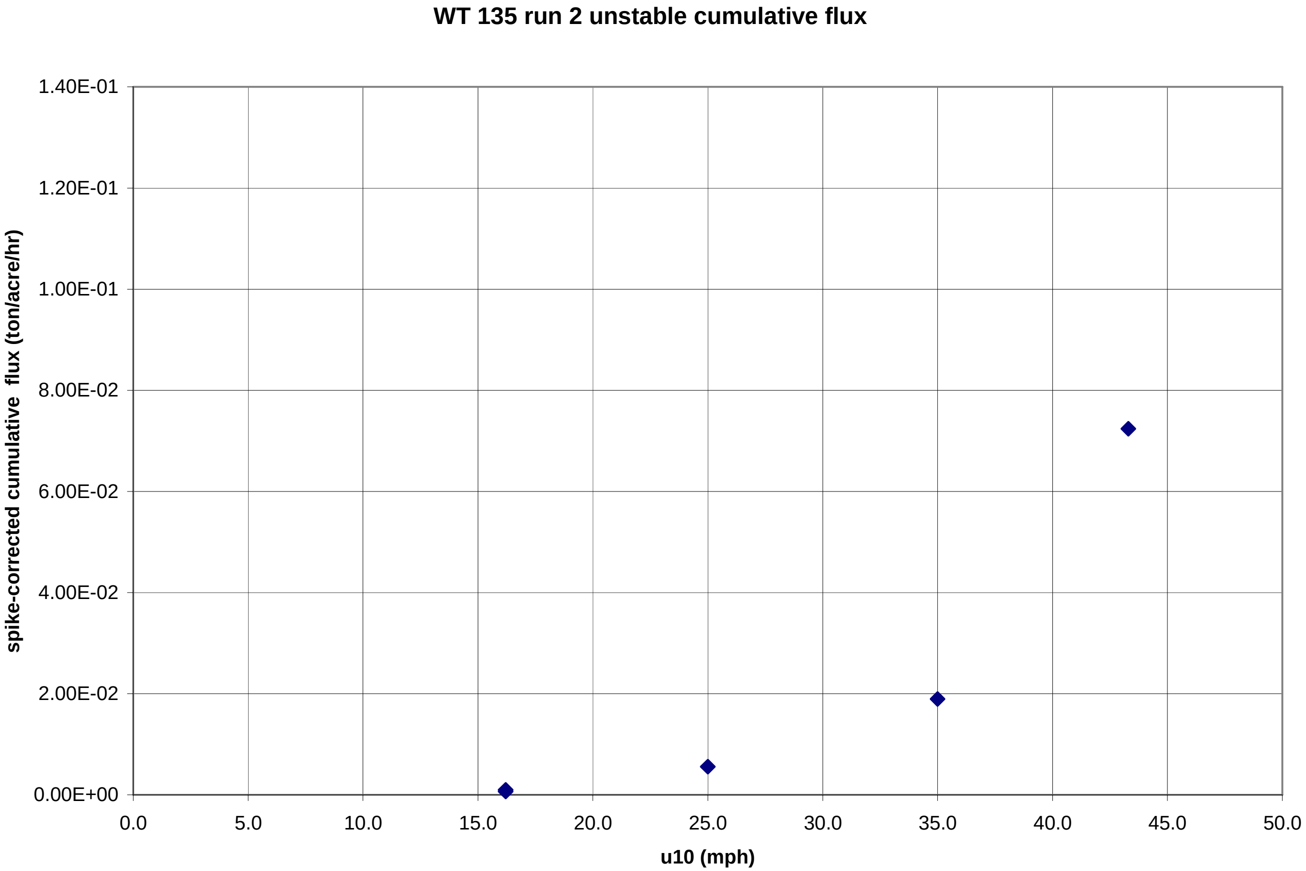
Appendix C (continued)

Figure 138 – U10 versus spike corrected flux – WT 135 2S



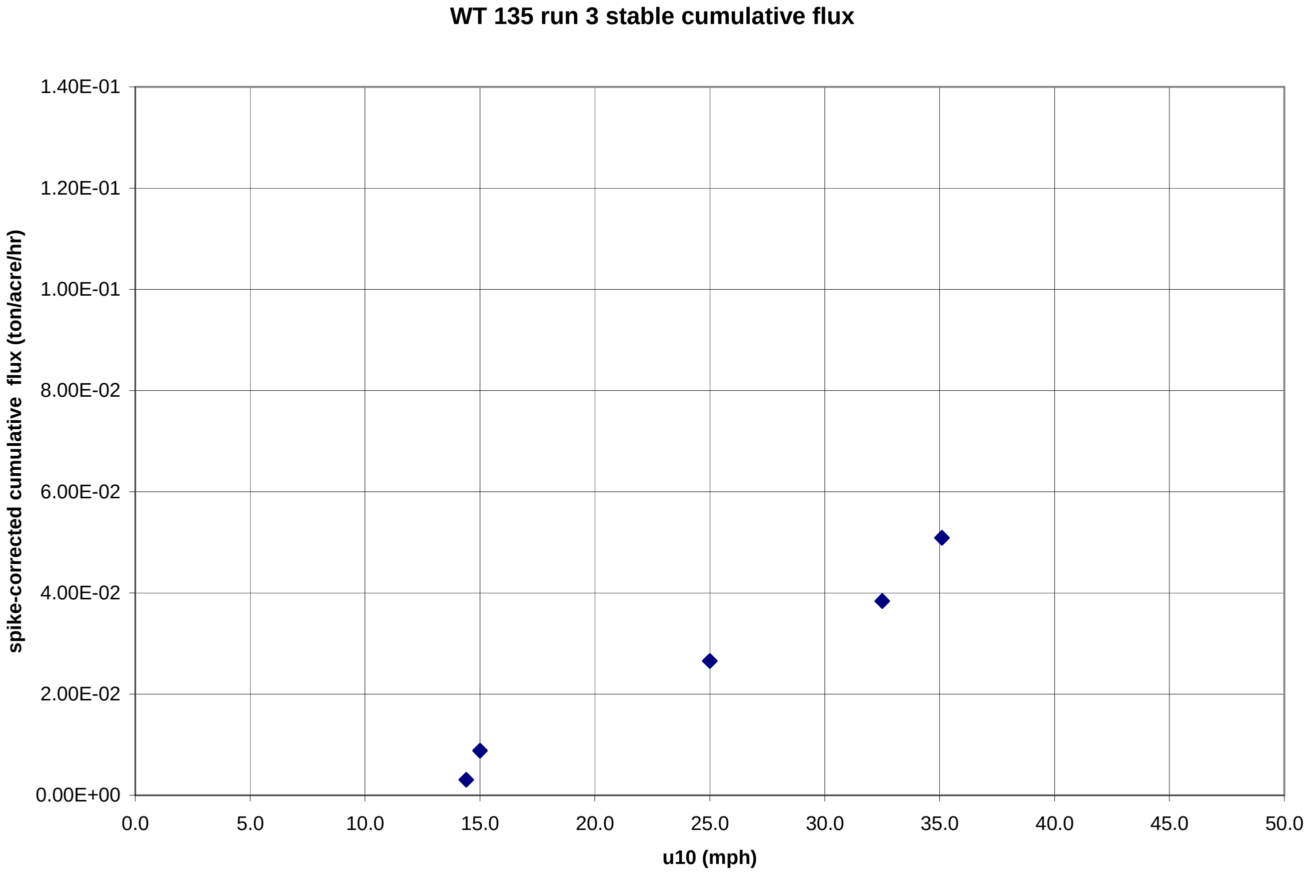
Appendix C (continued)

Figure 139 – U10 versus spike corrected flux – WT 135 2U



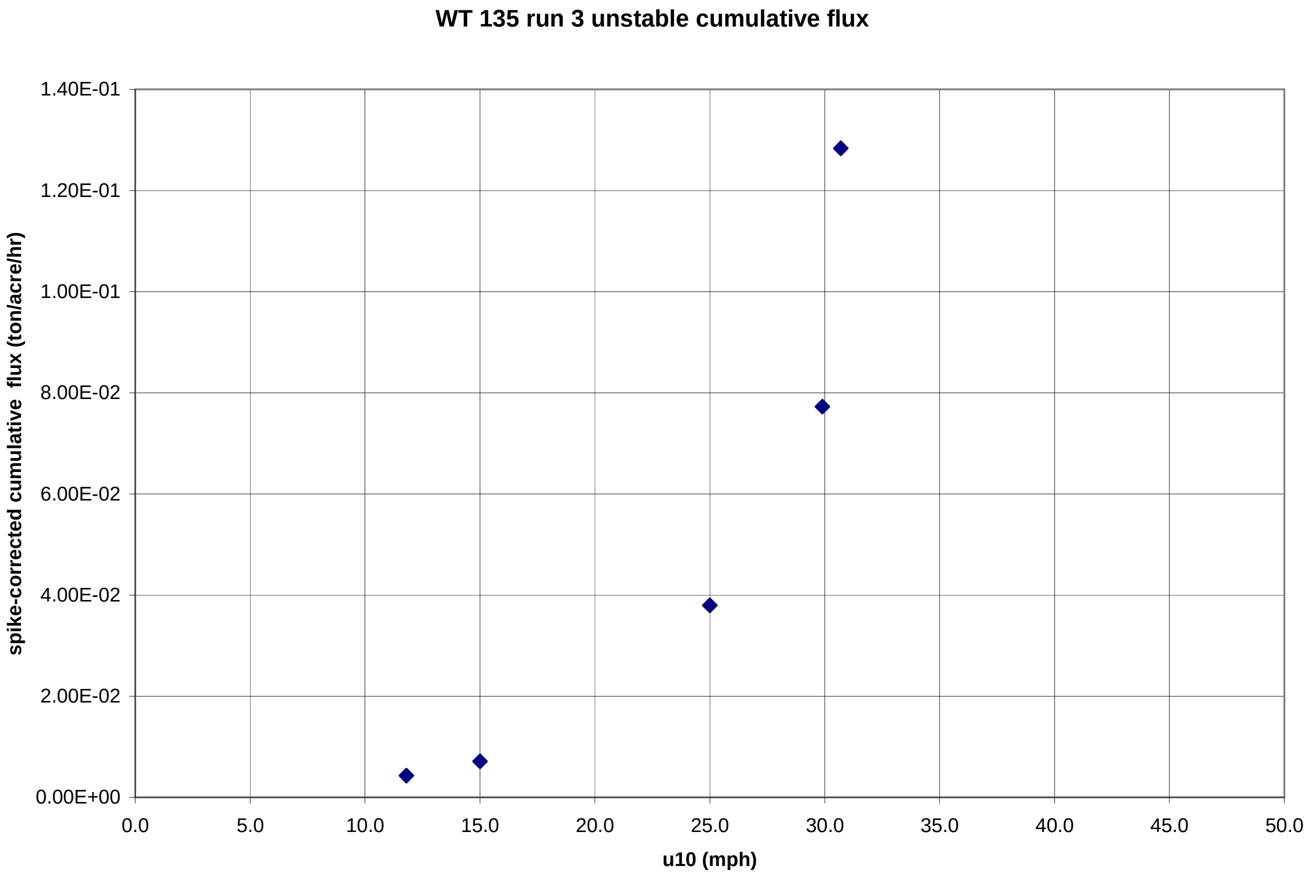
Appendix C (continued)

Figure 140 – U10 versus spike corrected flux – WT 135 3S



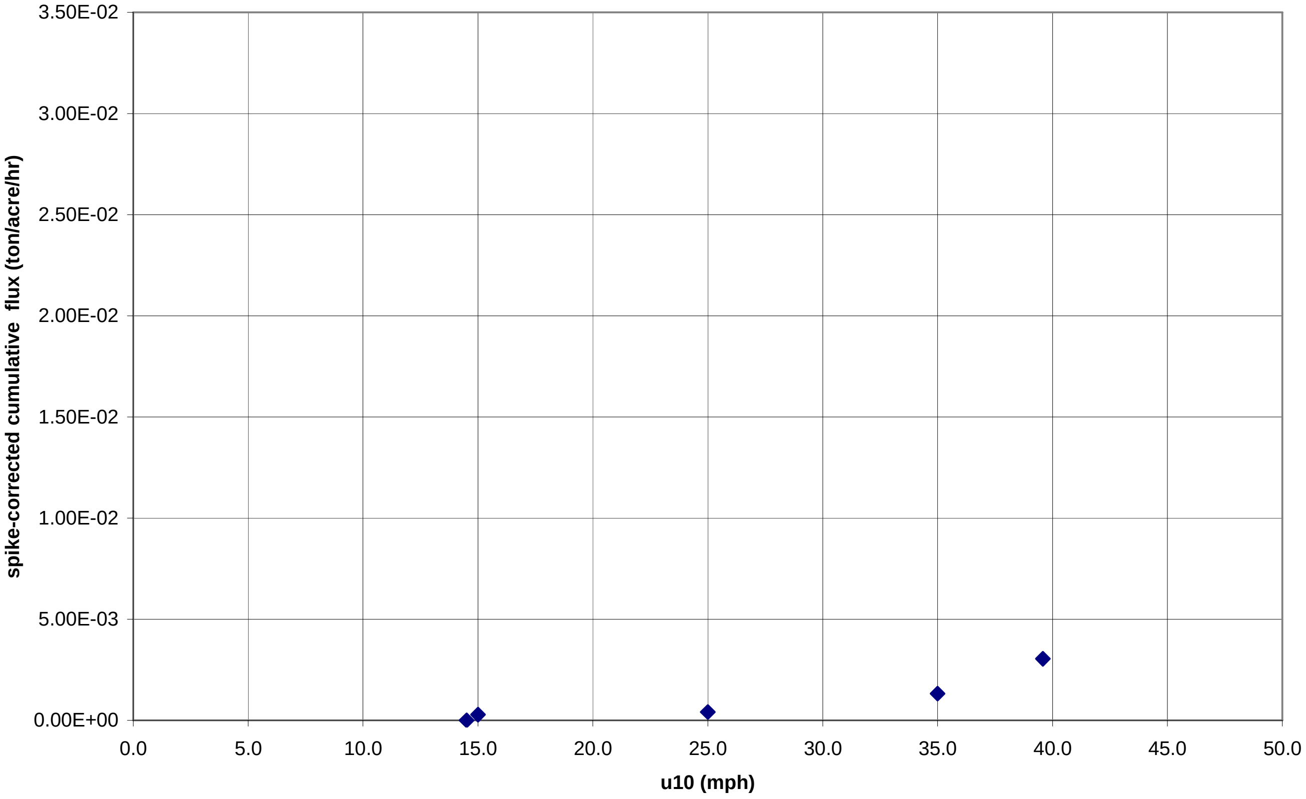
Appendix C (continued)

Figure 141 – U10 versus spike corrected flux – WT 135 3U



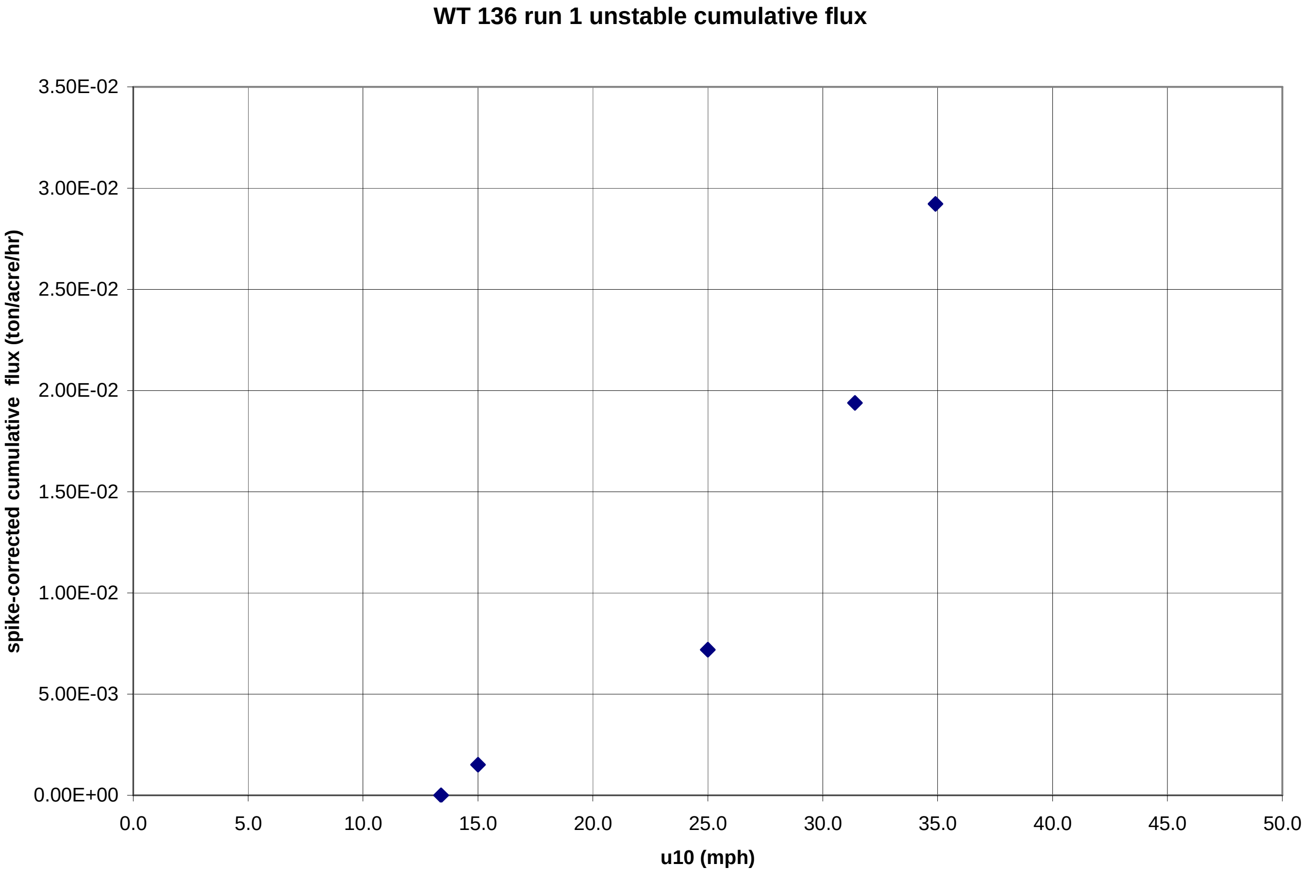
Appendix C (continued)

Figure 142 – U10 versus spike corrected flux – WT 136 1S


WT 136 run 1 stable cumulative flux

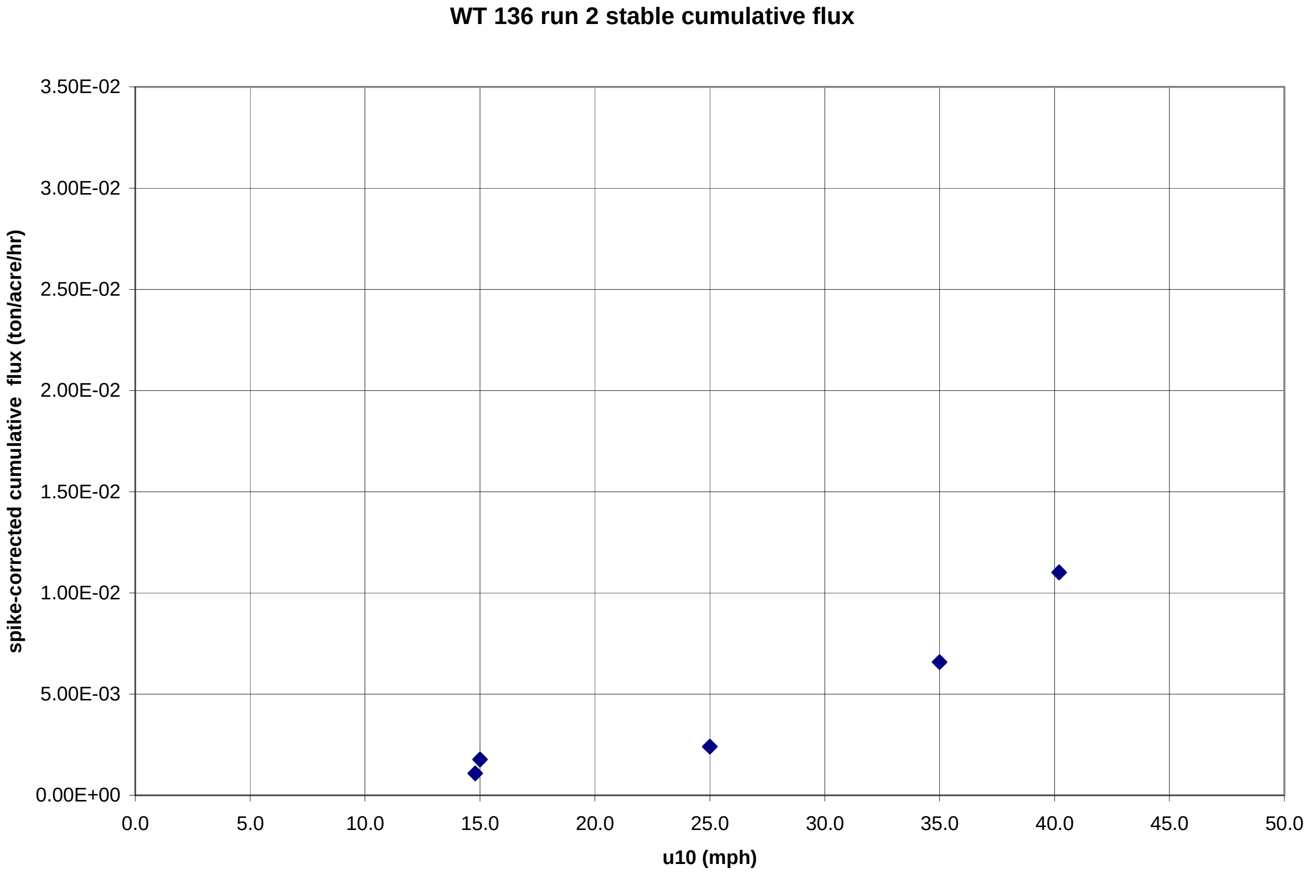
Appendix C (continued)

Figure 143 – U10 versus spike corrected flux – WT 136 1U



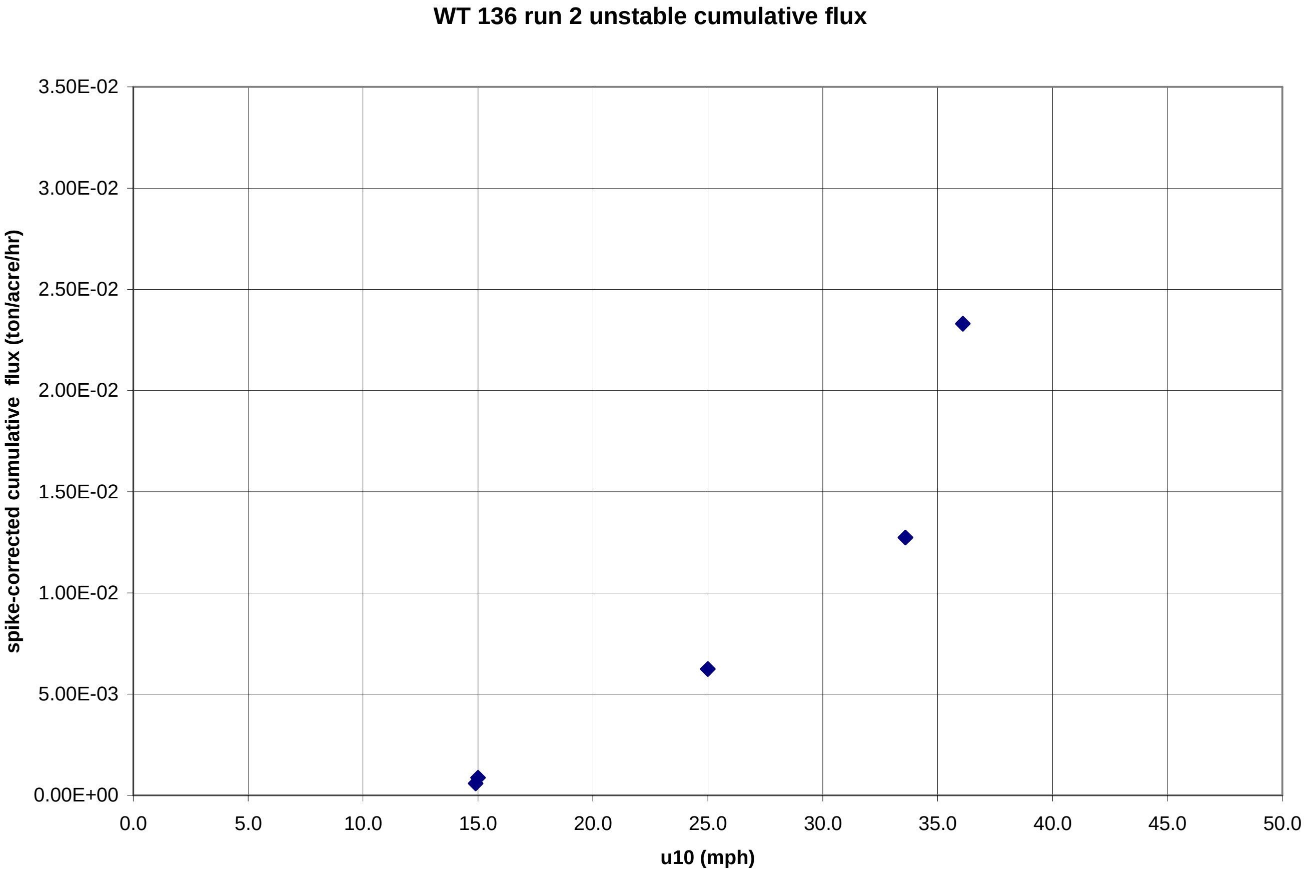
Appendix C (continued)

Figure 144 – U10 versus spike corrected flux – WT 136 2S



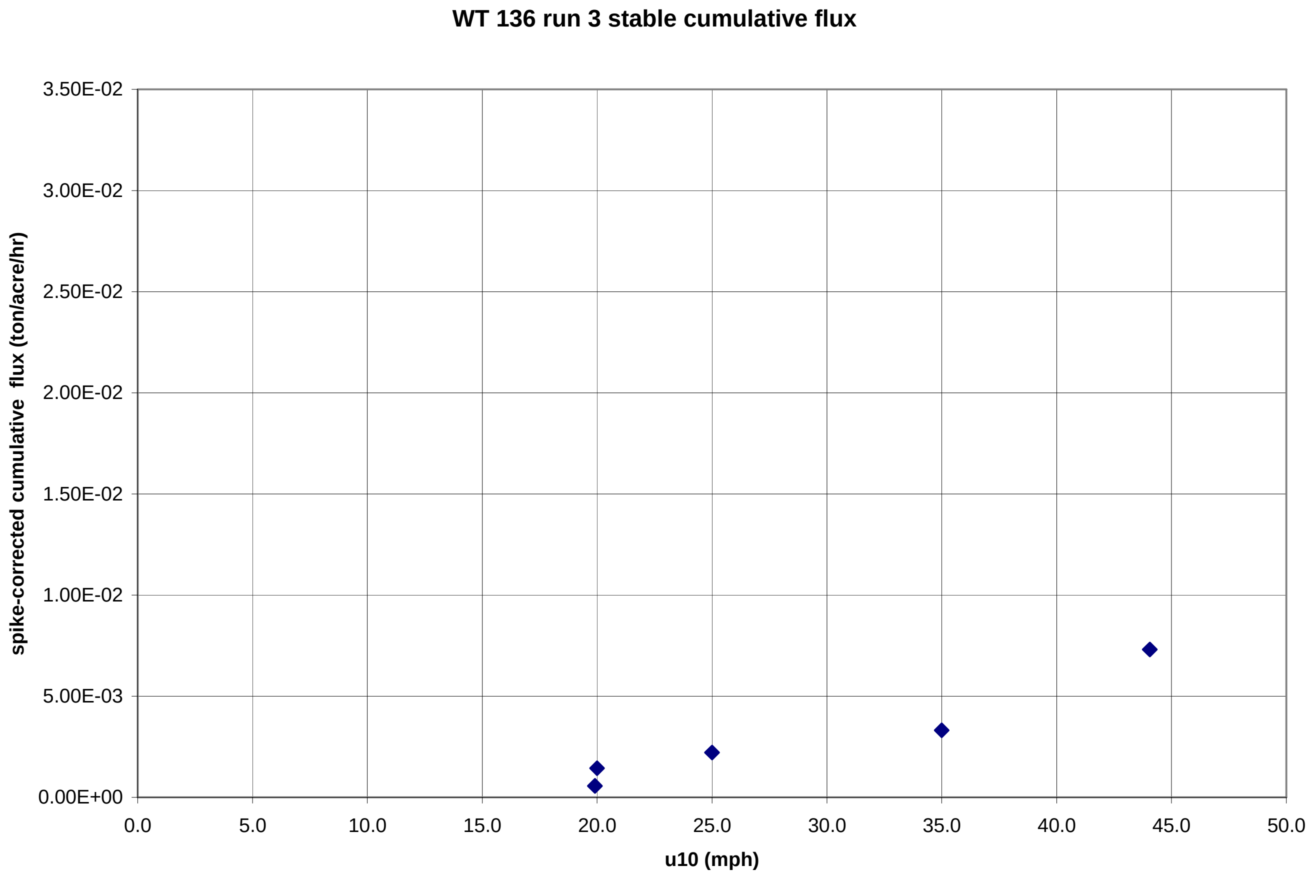
Appendix C (continued)

Figure 145 – U10 versus spike corrected flux – WT 136 2U



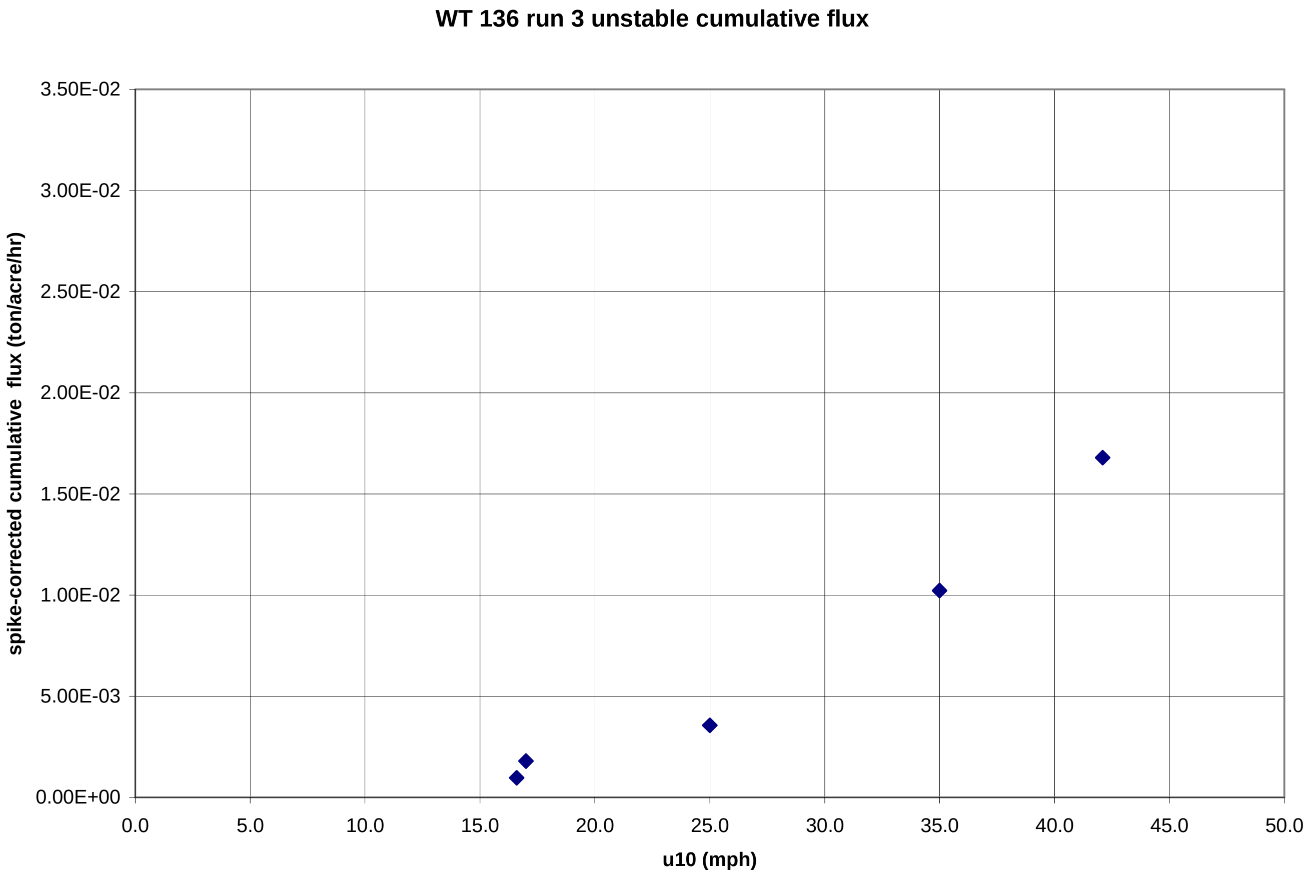
Appendix C (continued)

Figure 146 – U10 versus spike corrected flux – WT 136 3S



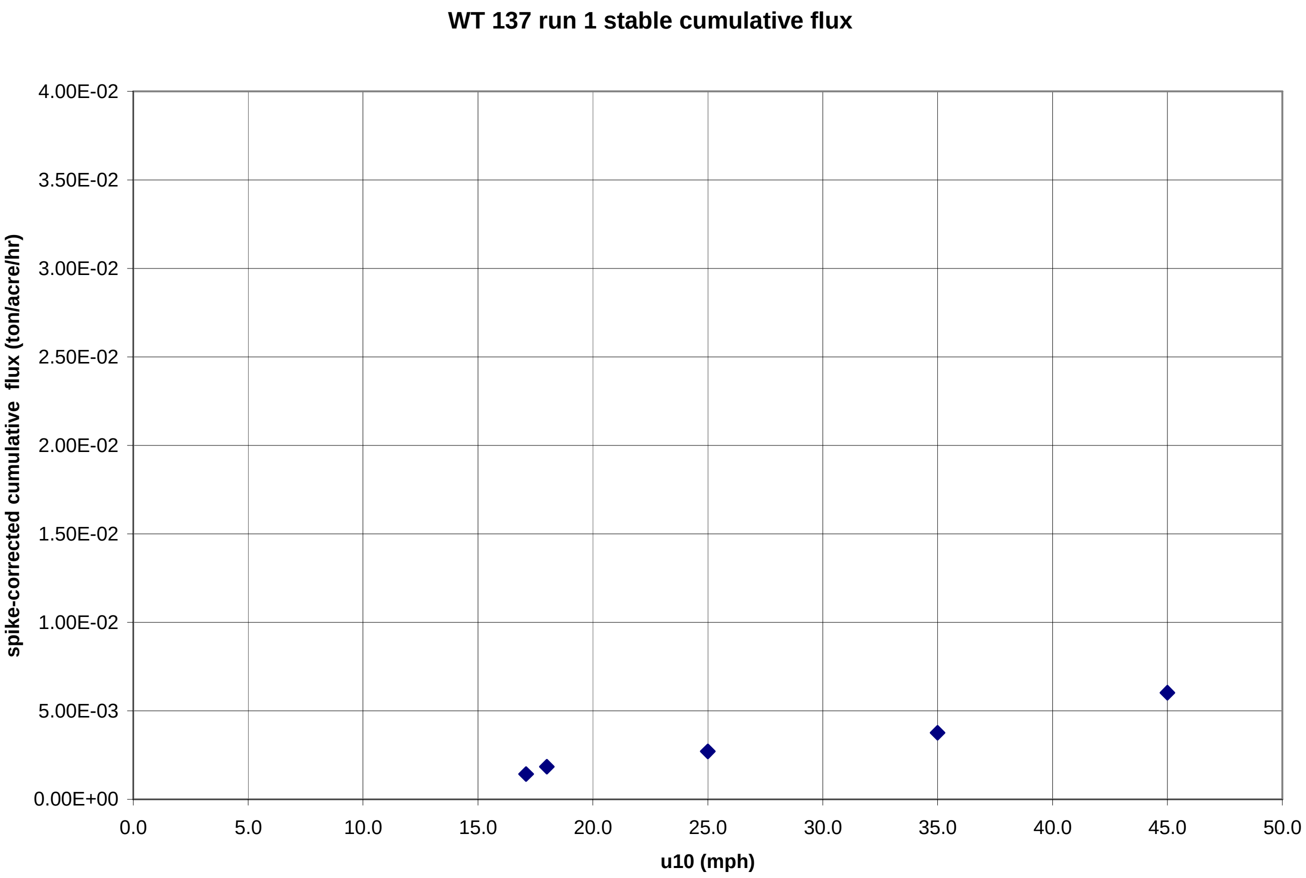
Appendix C (continued)

Figure 147 – U10 versus spike corrected flux – WT 136 3U



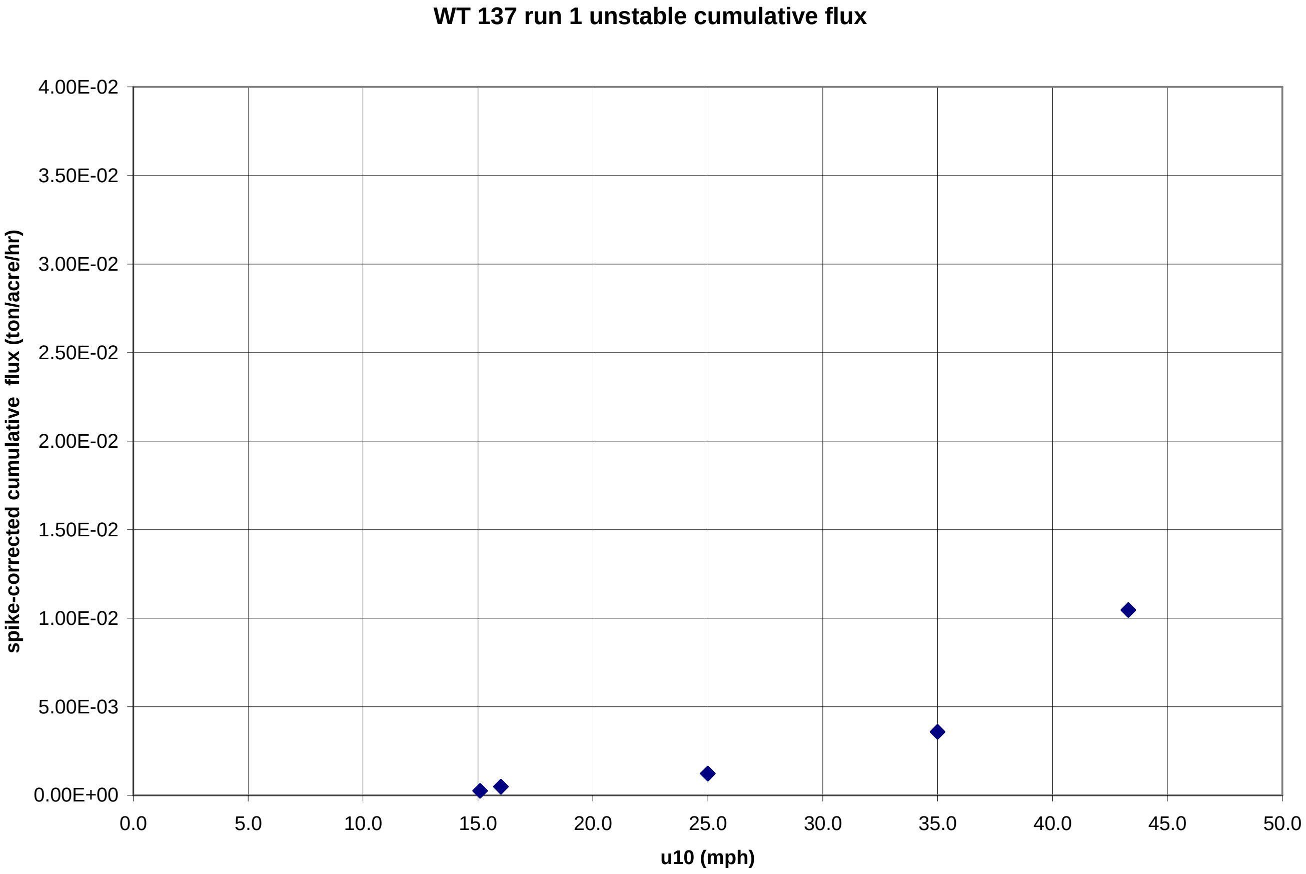
Appendix C (continued)

Figure 148 – U10 versus spike corrected flux – WT 137 1S



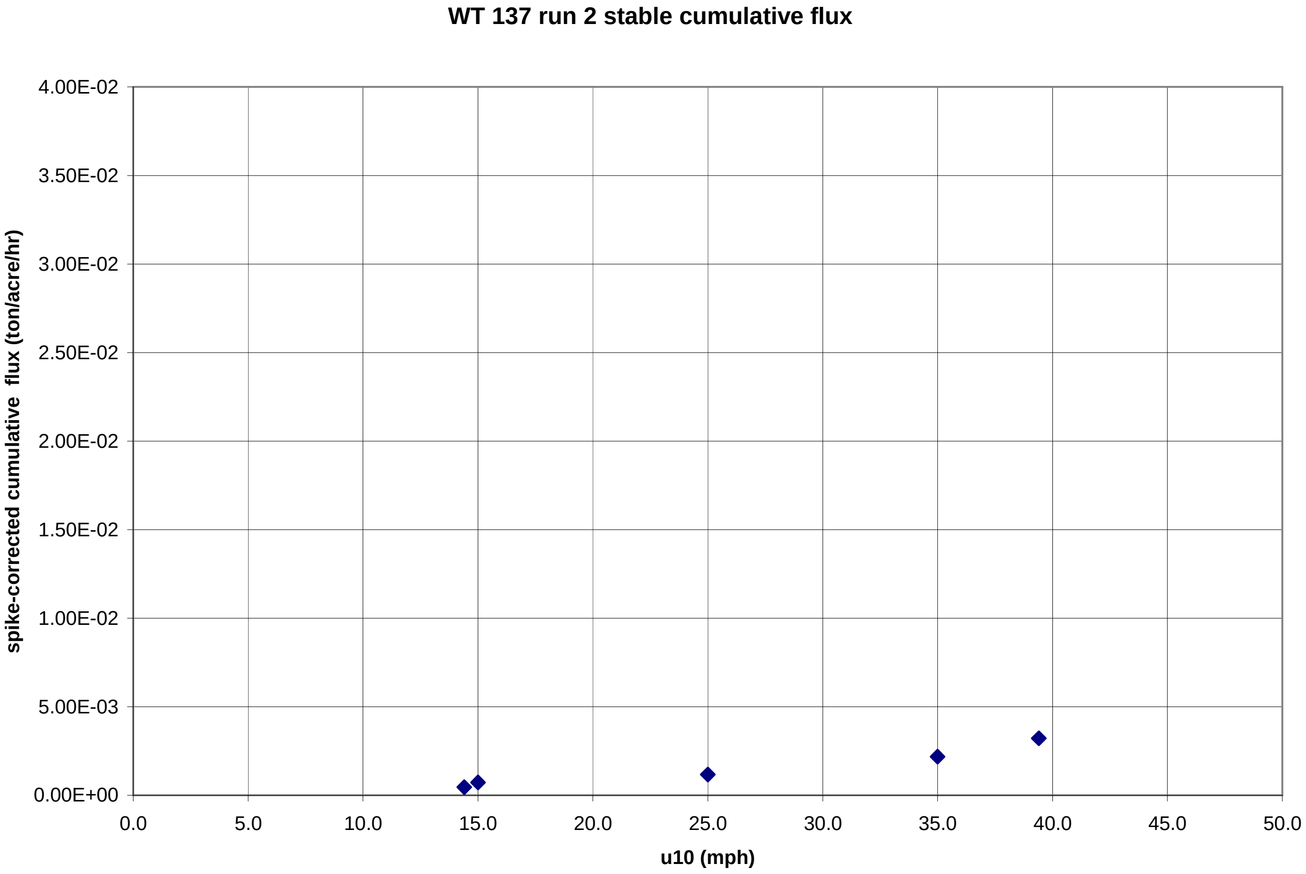
Appendix C (continued)

Figure 149 – U10 versus spike corrected flux – WT 137 1U



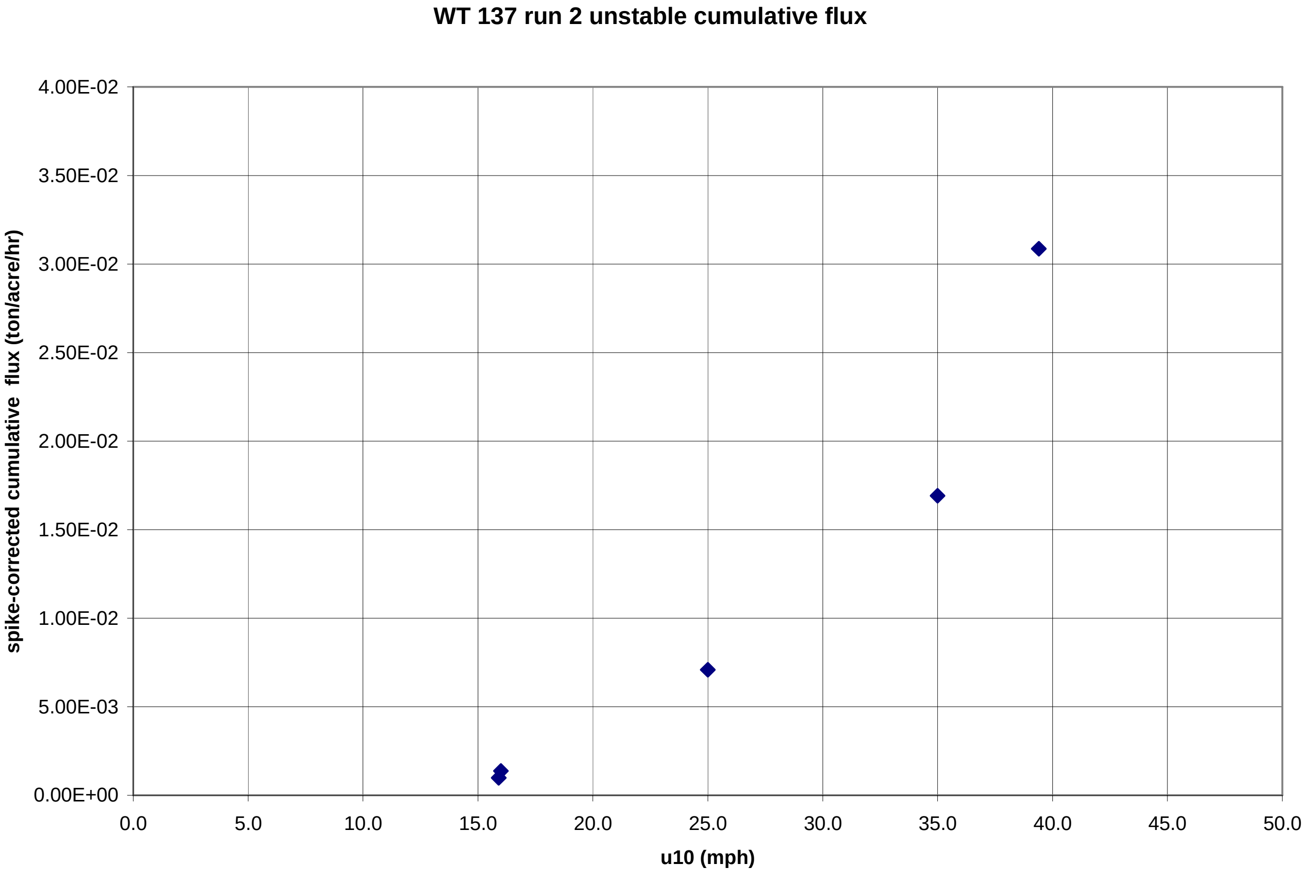
Appendix C (continued)

Figure 150 – U10 versus spike corrected flux – WT 137 2S



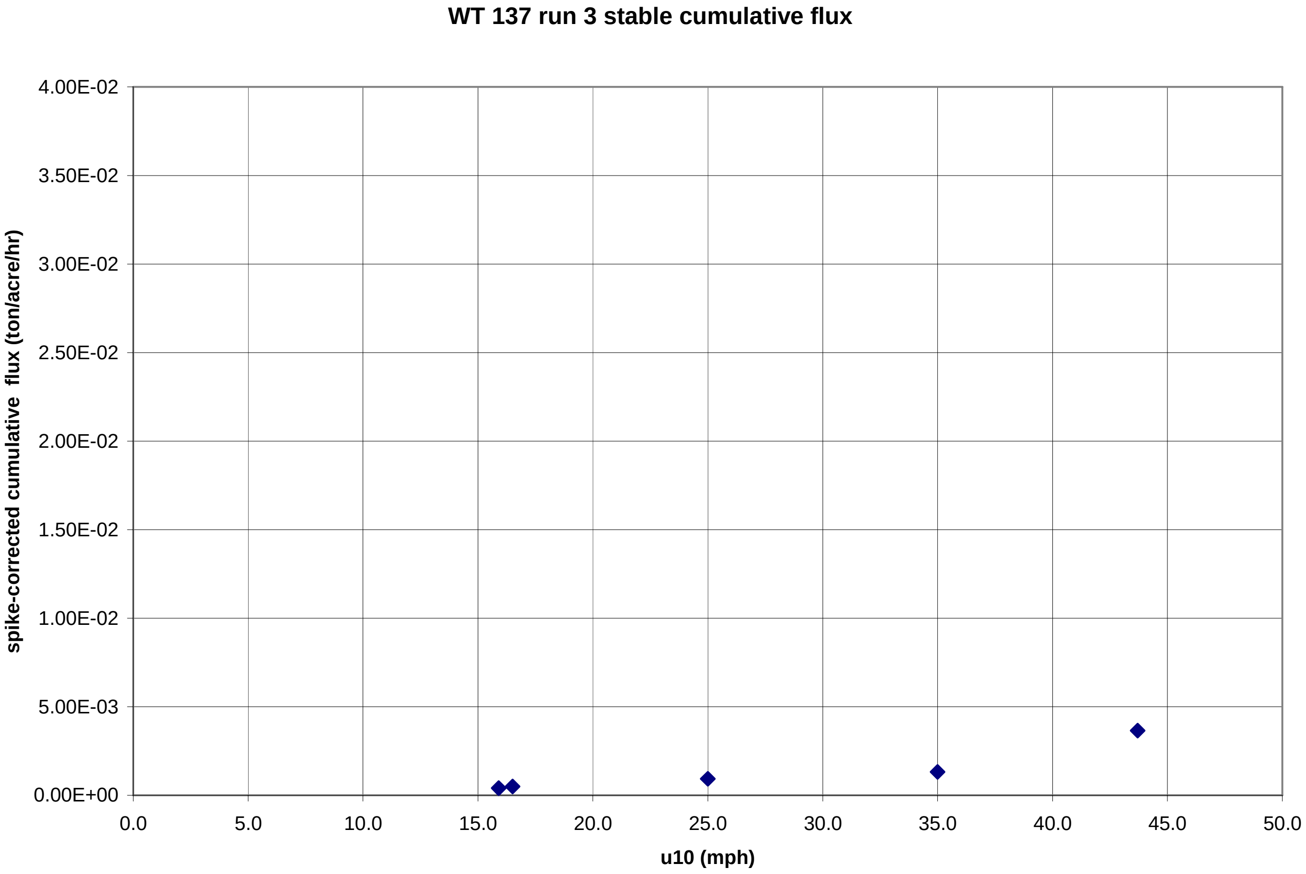
Appendix C (continued)

Figure 151 – U10 versus spike corrected flux – WT 137 2U



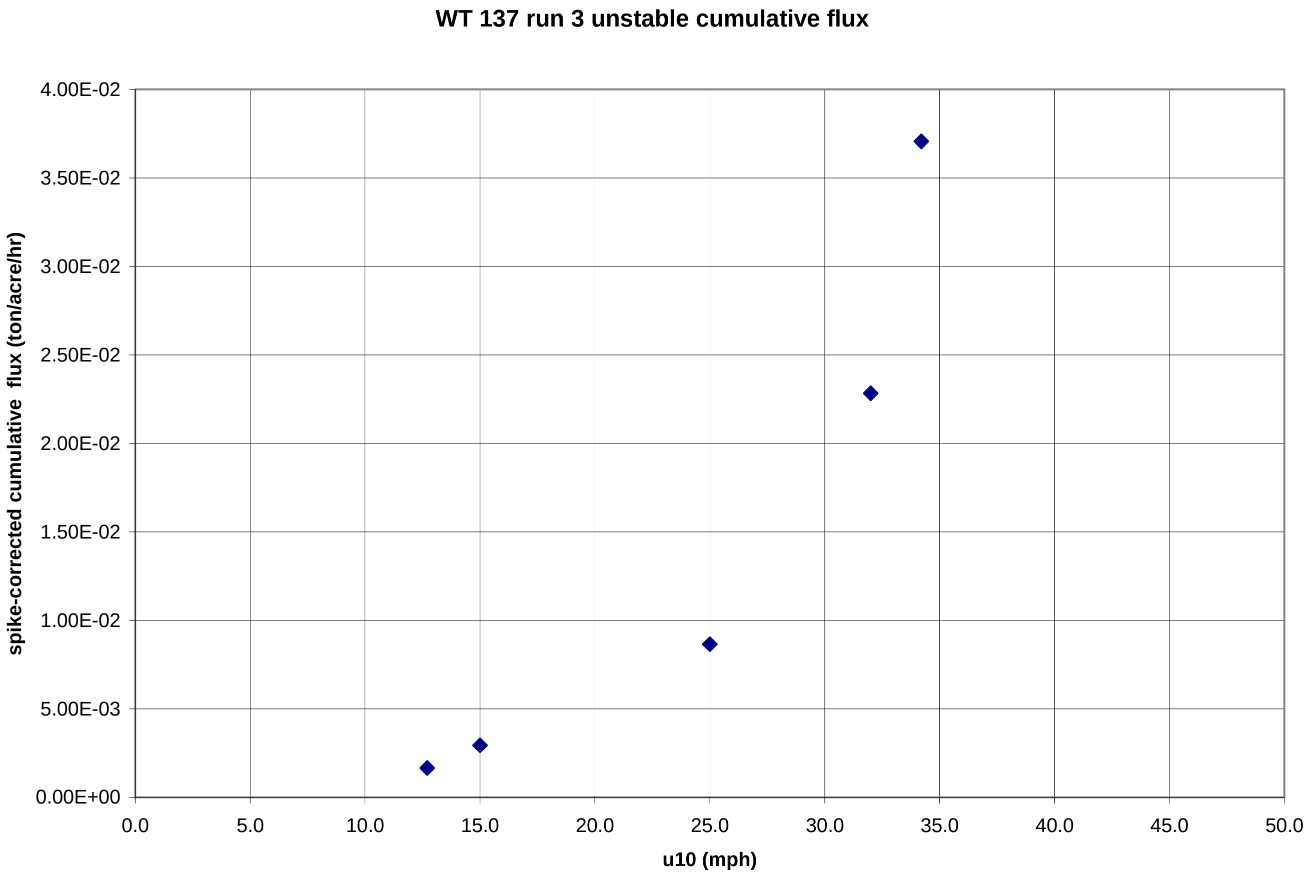
Appendix C (continued)

Figure 152 – U10 versus spike corrected flux – WT 137 3S



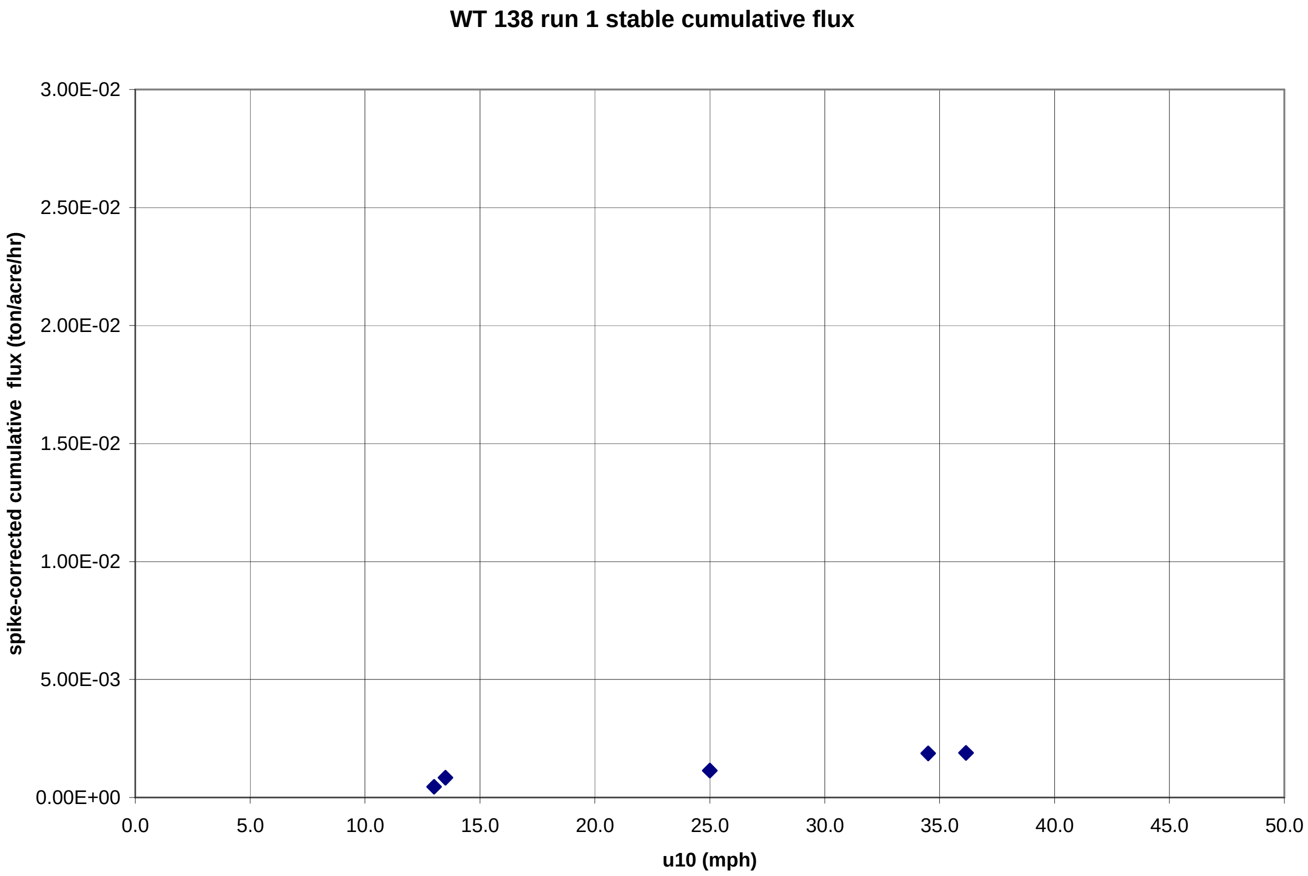
Appendix C (continued)

Figure 153 – U10 versus spike corrected flux – WT 137 3U



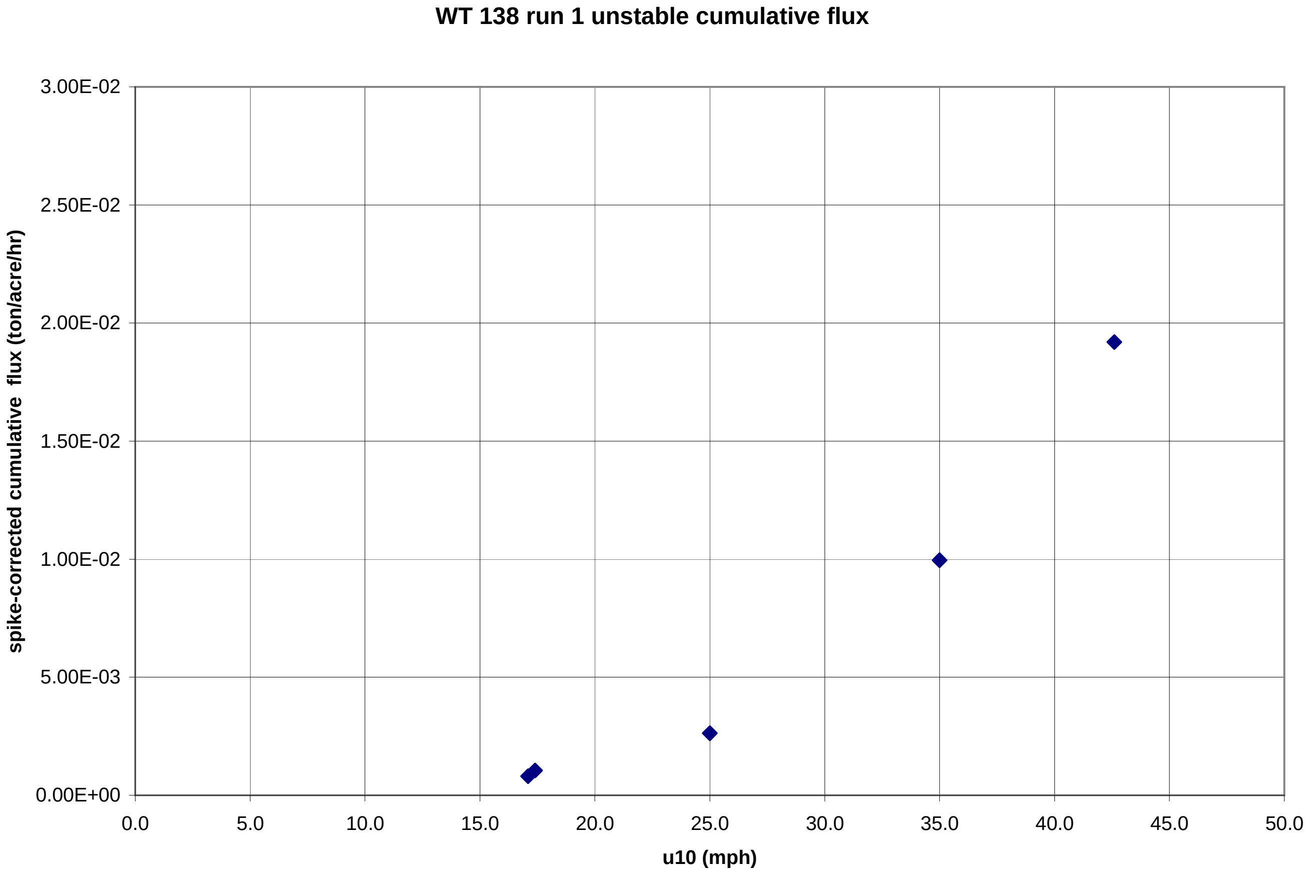
Appendix C (continued)

Figure 154 – U10 versus spike corrected flux – WT 138 1S



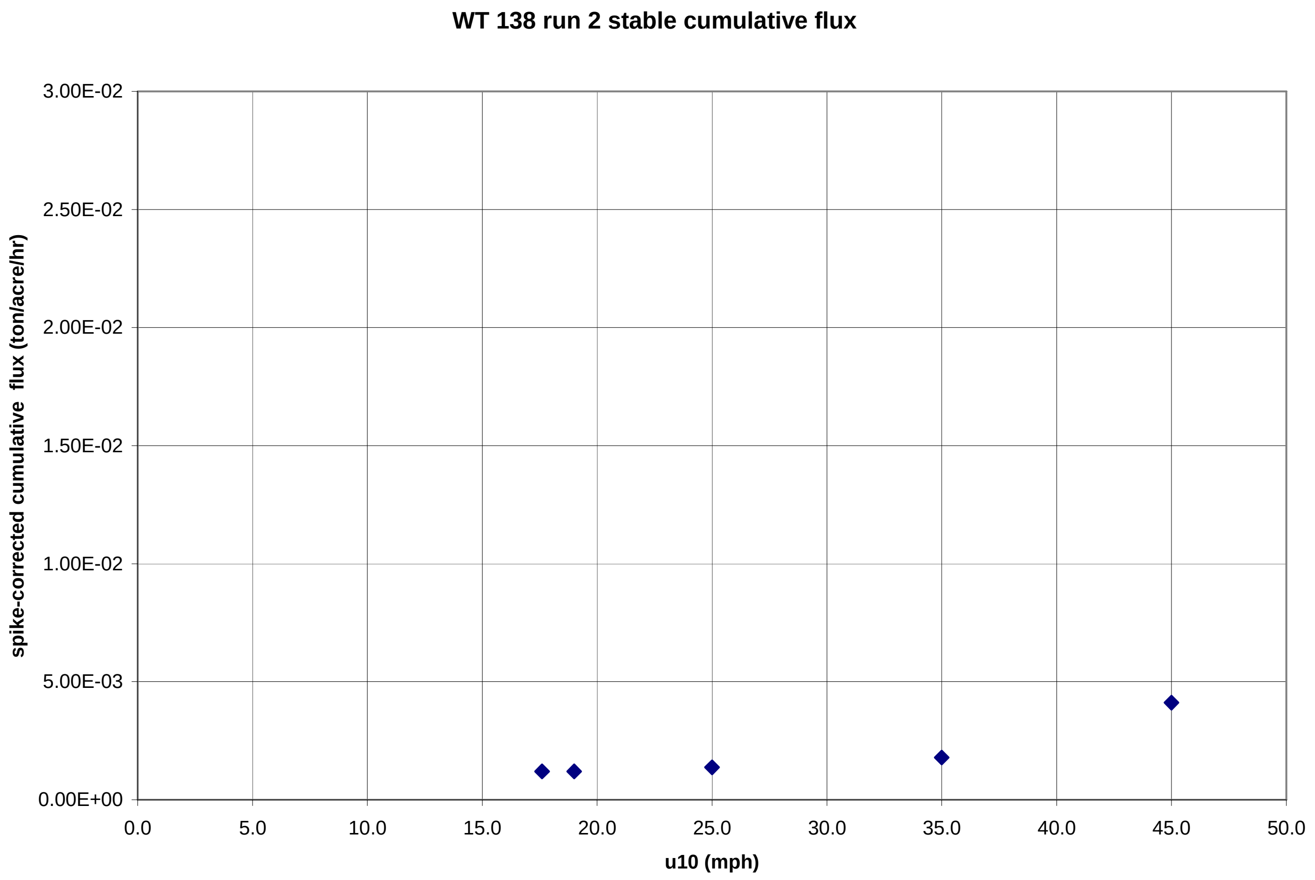
Appendix C (continued)

Figure 155 – U10 versus spike corrected flux – WT 138 1U



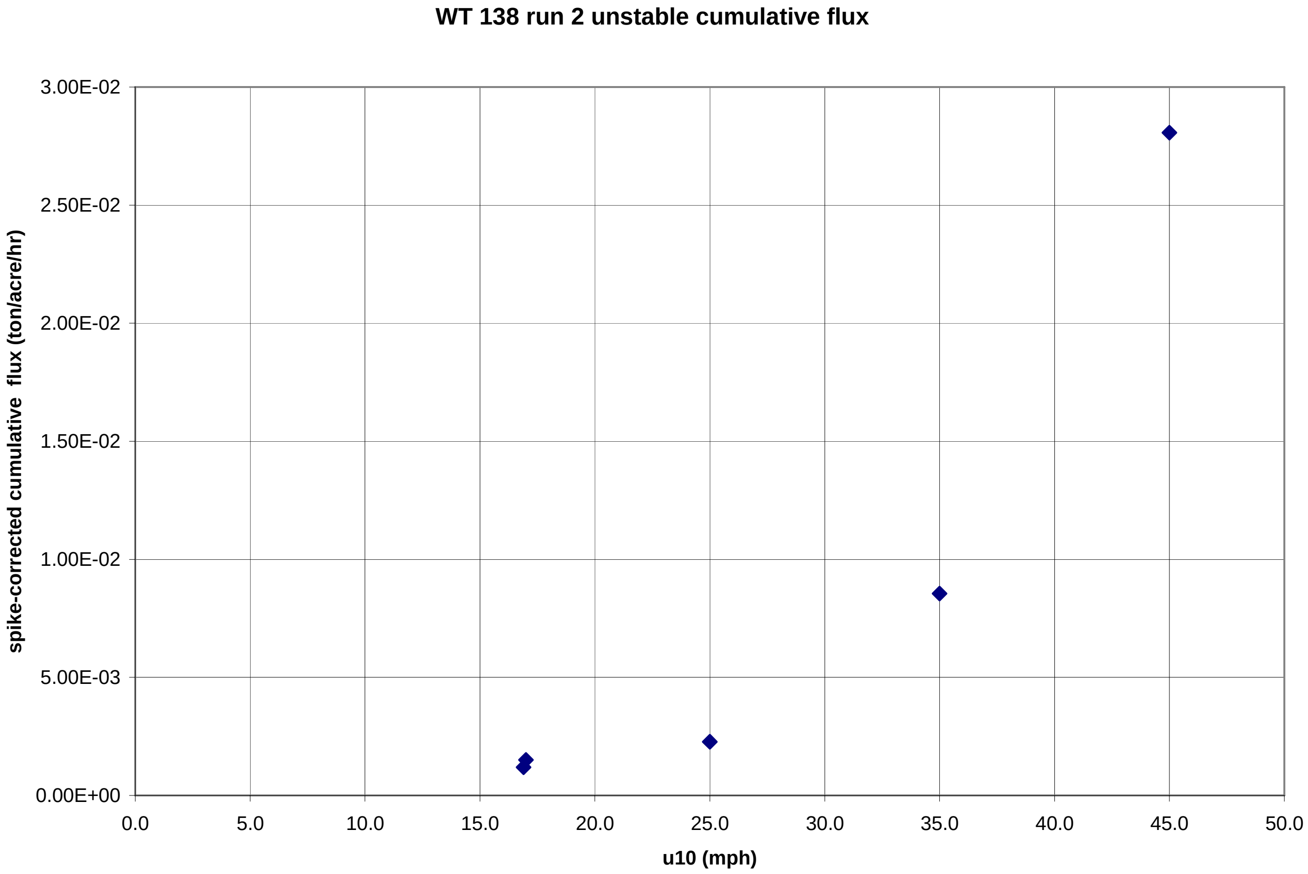
Appendix C (continued)

Figure 156 – U10 versus spike corrected flux – WT 138 2S



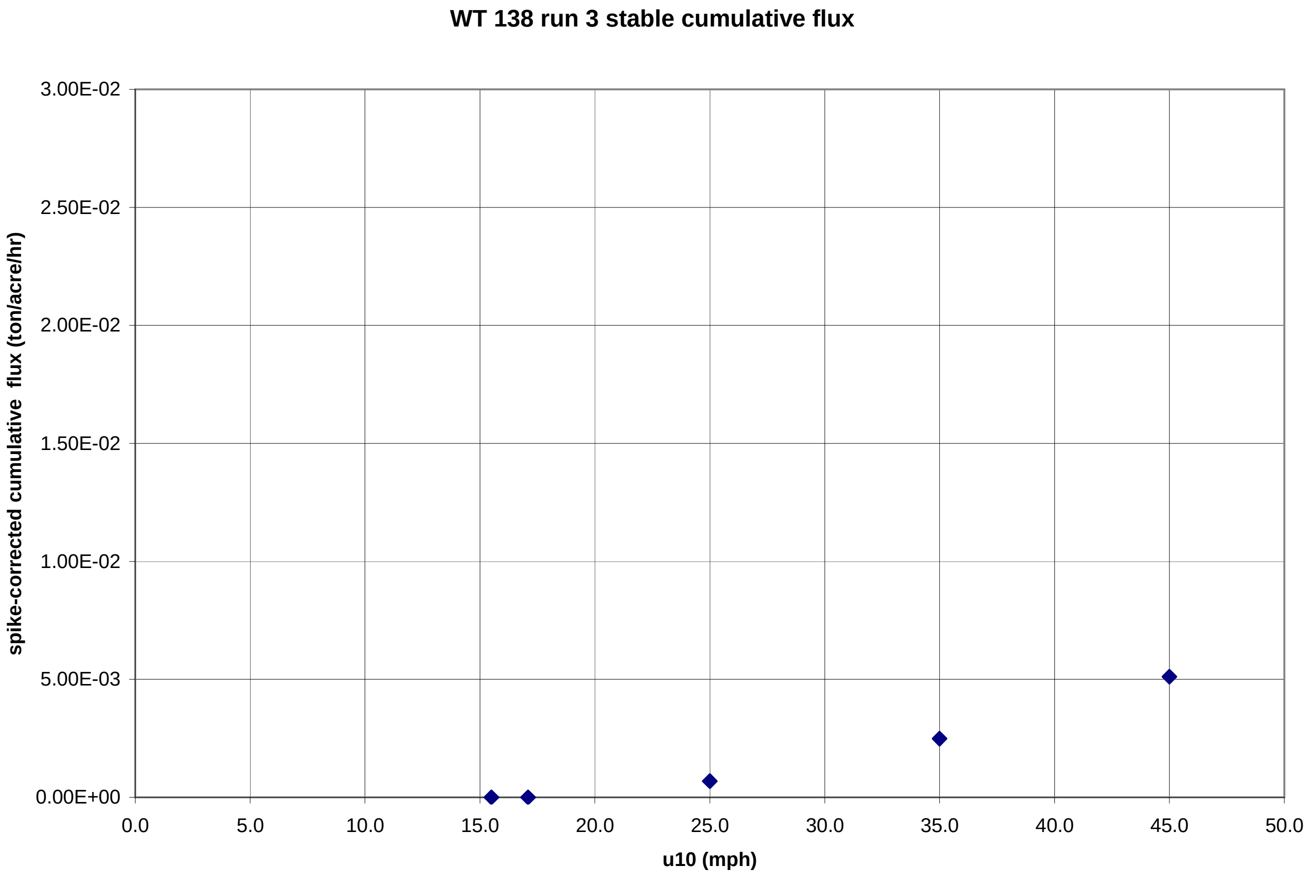
Appendix C (continued)

Figure 157 – U10 versus spike corrected flux – WT 138 2U



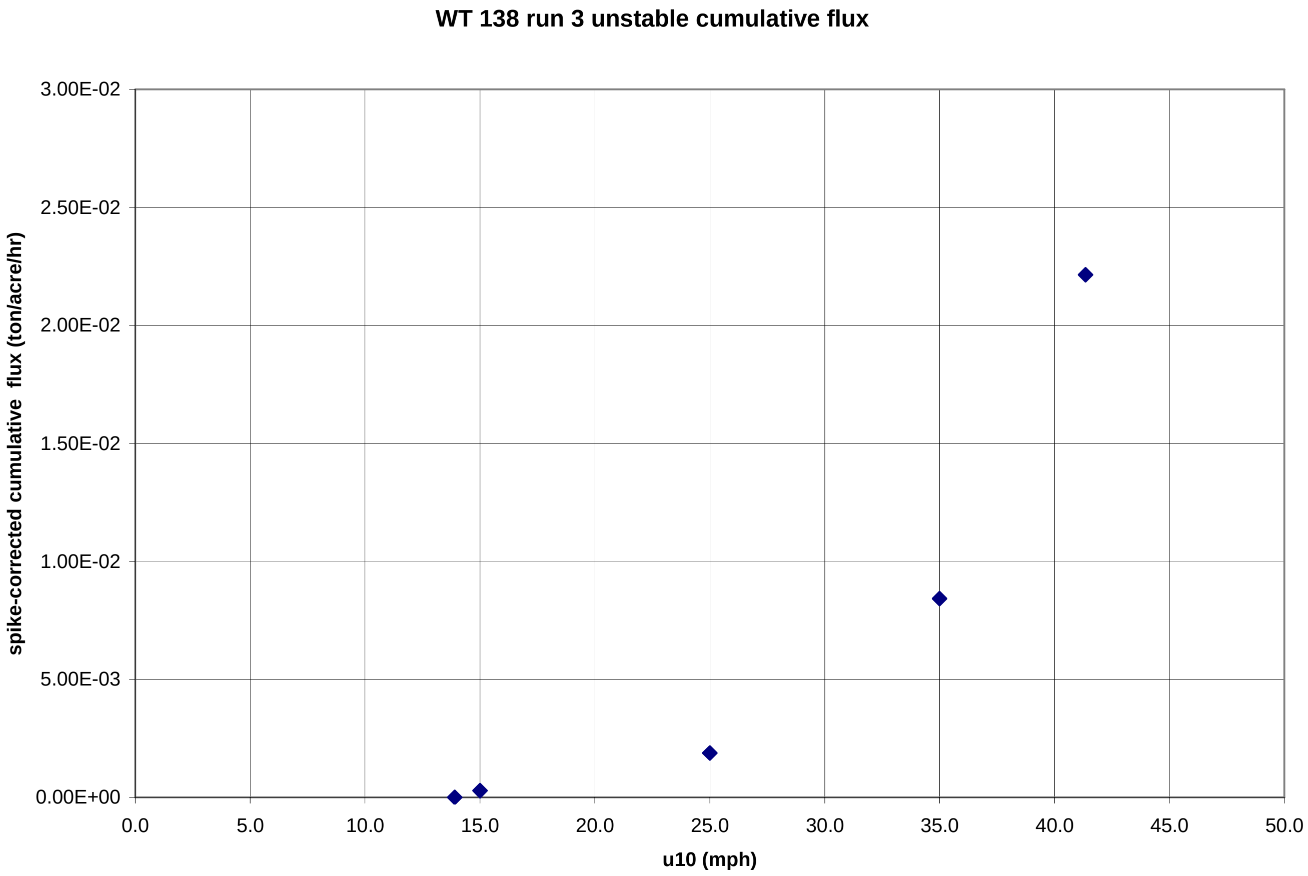
Appendix C (continued)

Figure 158 – U10 versus spike corrected flux – WT 138 3S



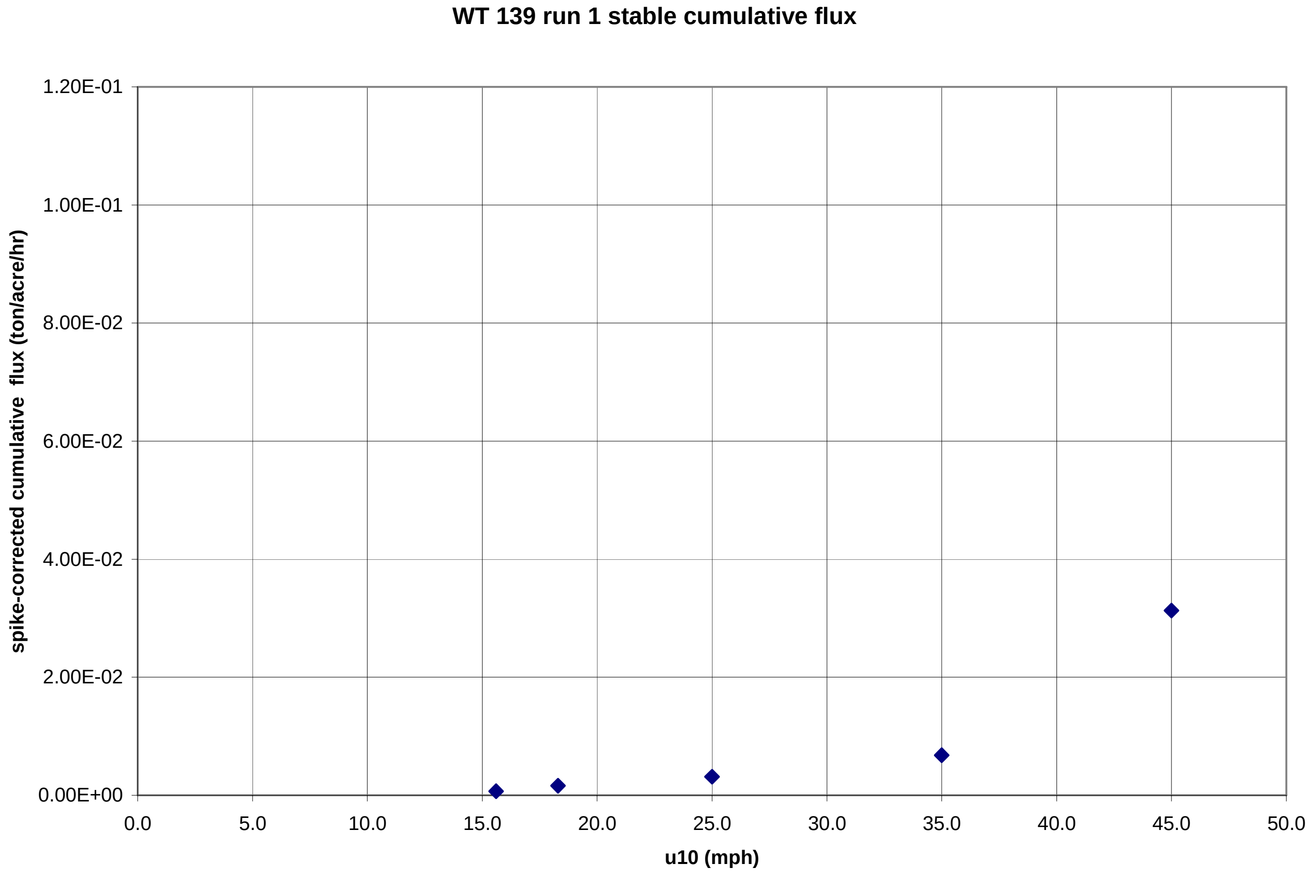
Appendix C (continued)

Figure 159 – U10 versus spike corrected flux – WT 138 3U



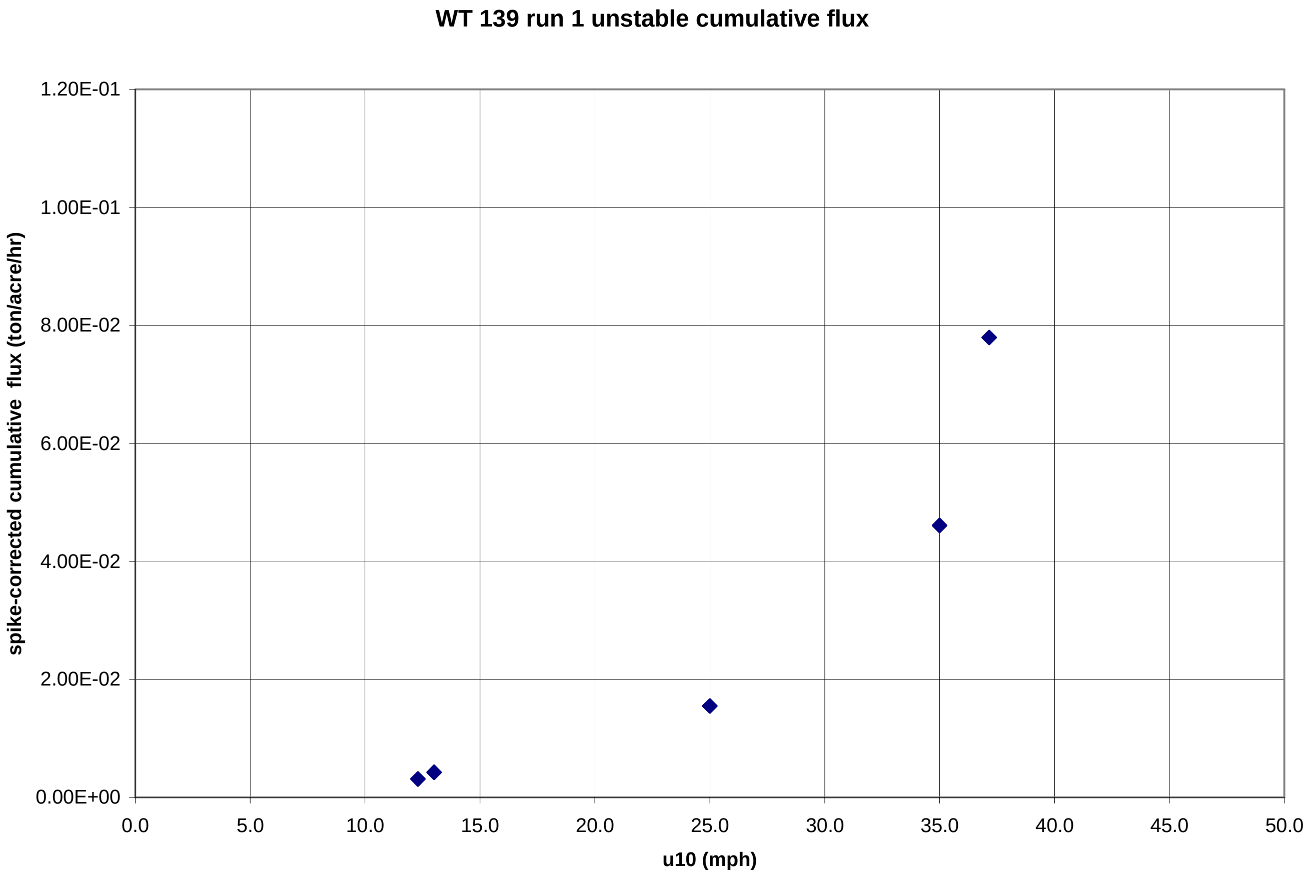
Appendix C (continued)

Figure 160 – U10 versus spike corrected flux – WT 139 1S



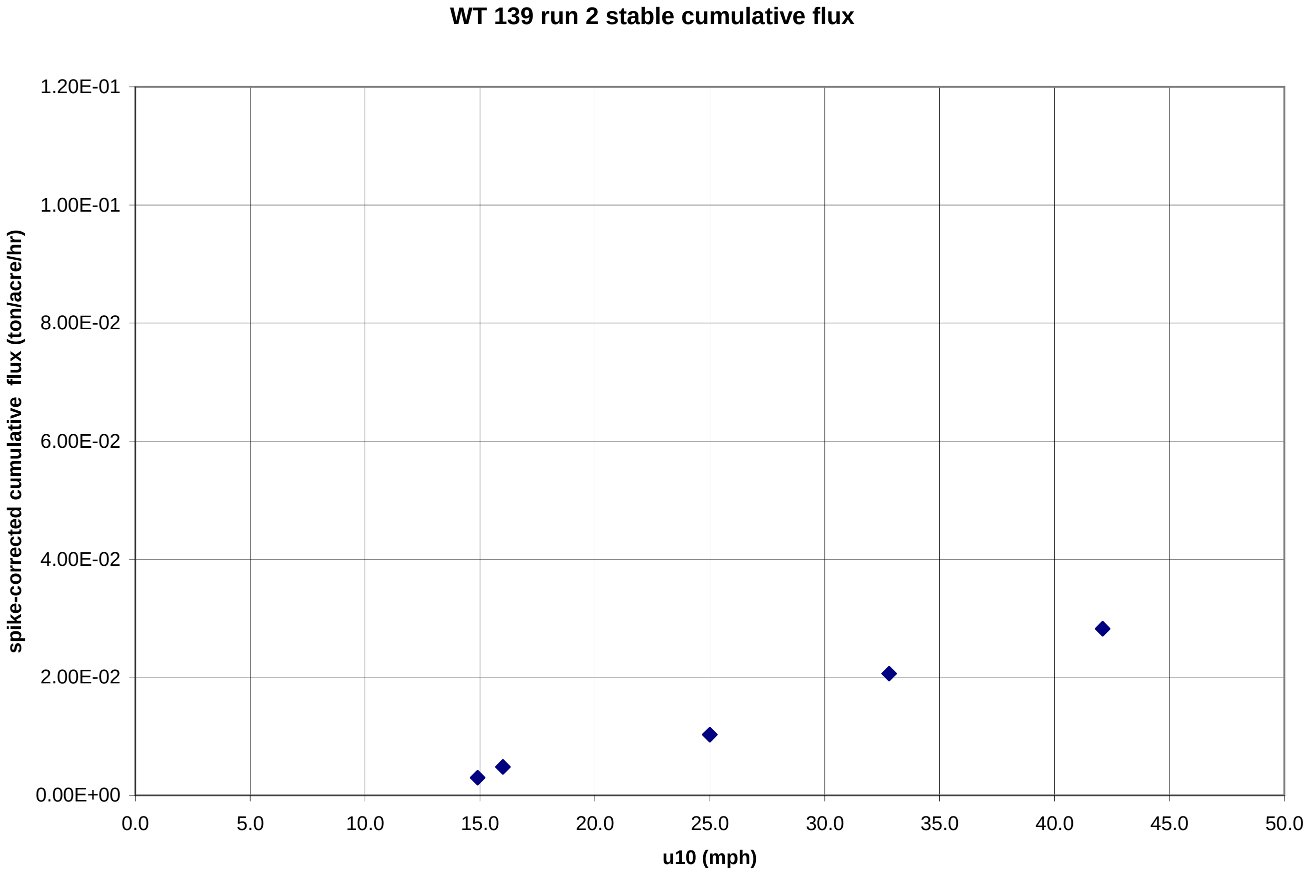
Appendix C (continued)

Figure 161 – U10 versus spike corrected flux – WT 139 1U



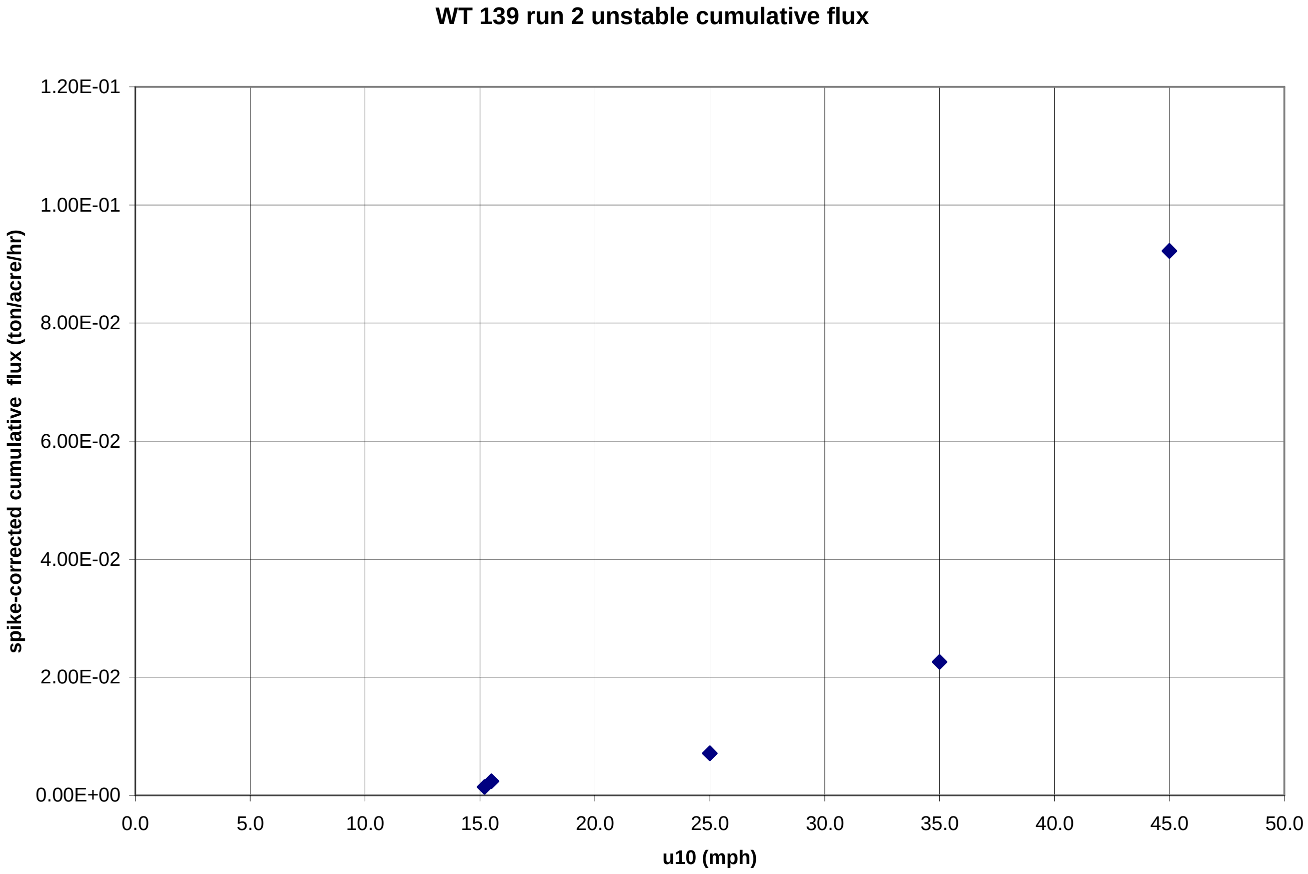
Appendix C (continued)

Figure 162 – U10 versus spike corrected flux – WT 139 2S



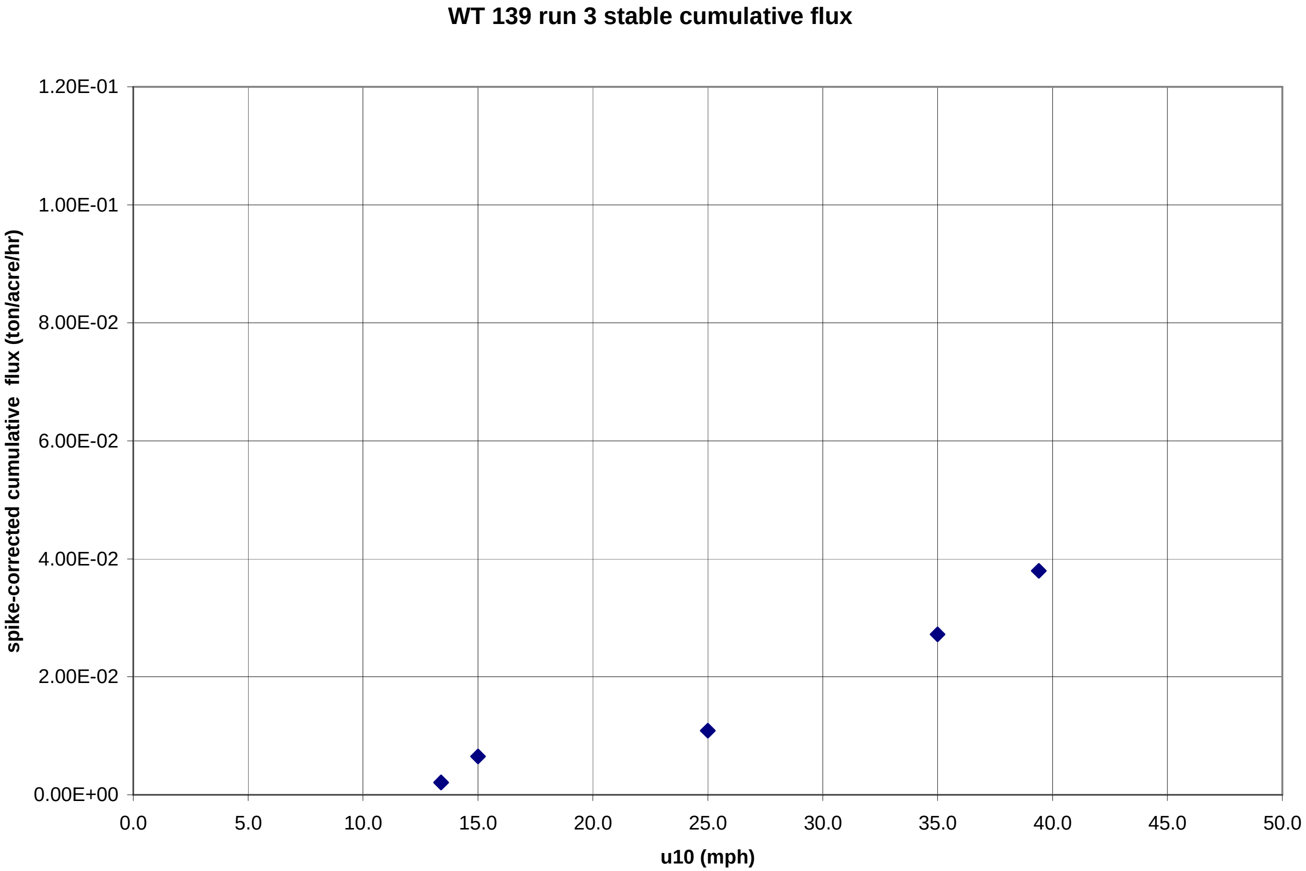
Appendix C (continued)

Figure 163 – U10 versus spike corrected flux – WT 139 2U



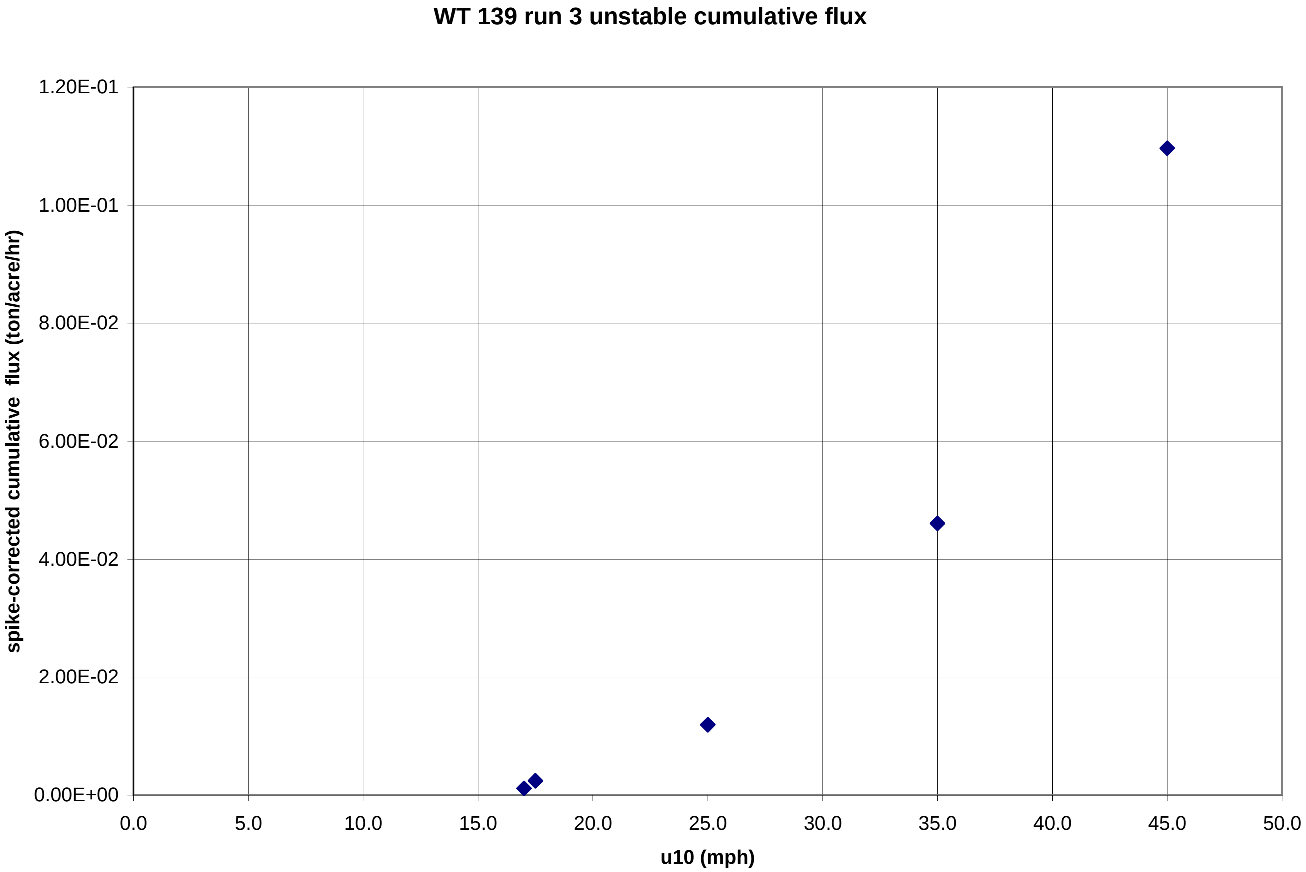
Appendix C (continued)

Figure 164 – U10 versus spike corrected flux – WT 139 3S



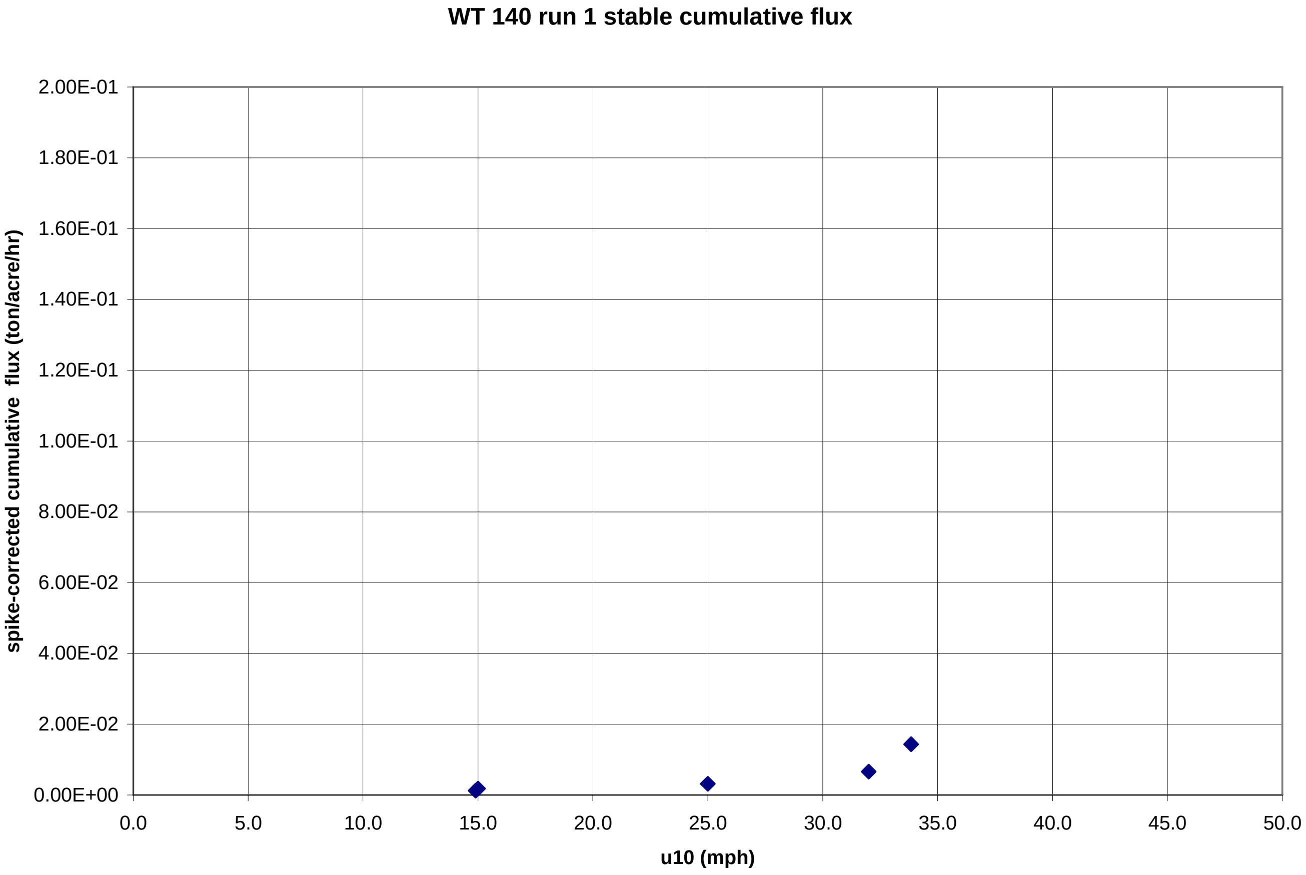
Appendix C (continued)

Figure 165 – U10 versus spike corrected flux – WT 139 3U



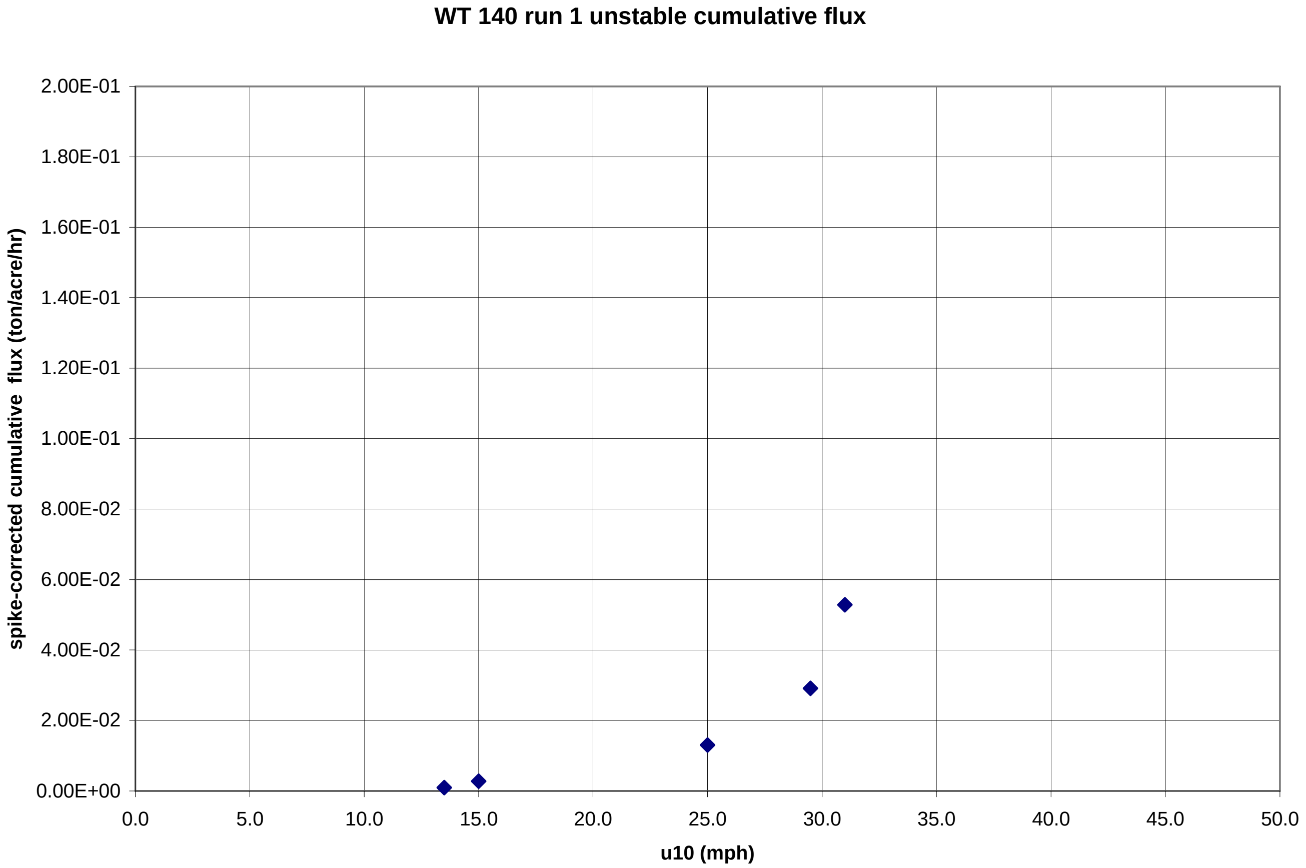
Appendix C (continued)

Figure 166 – U10 versus spike corrected flux – WT 140 1S



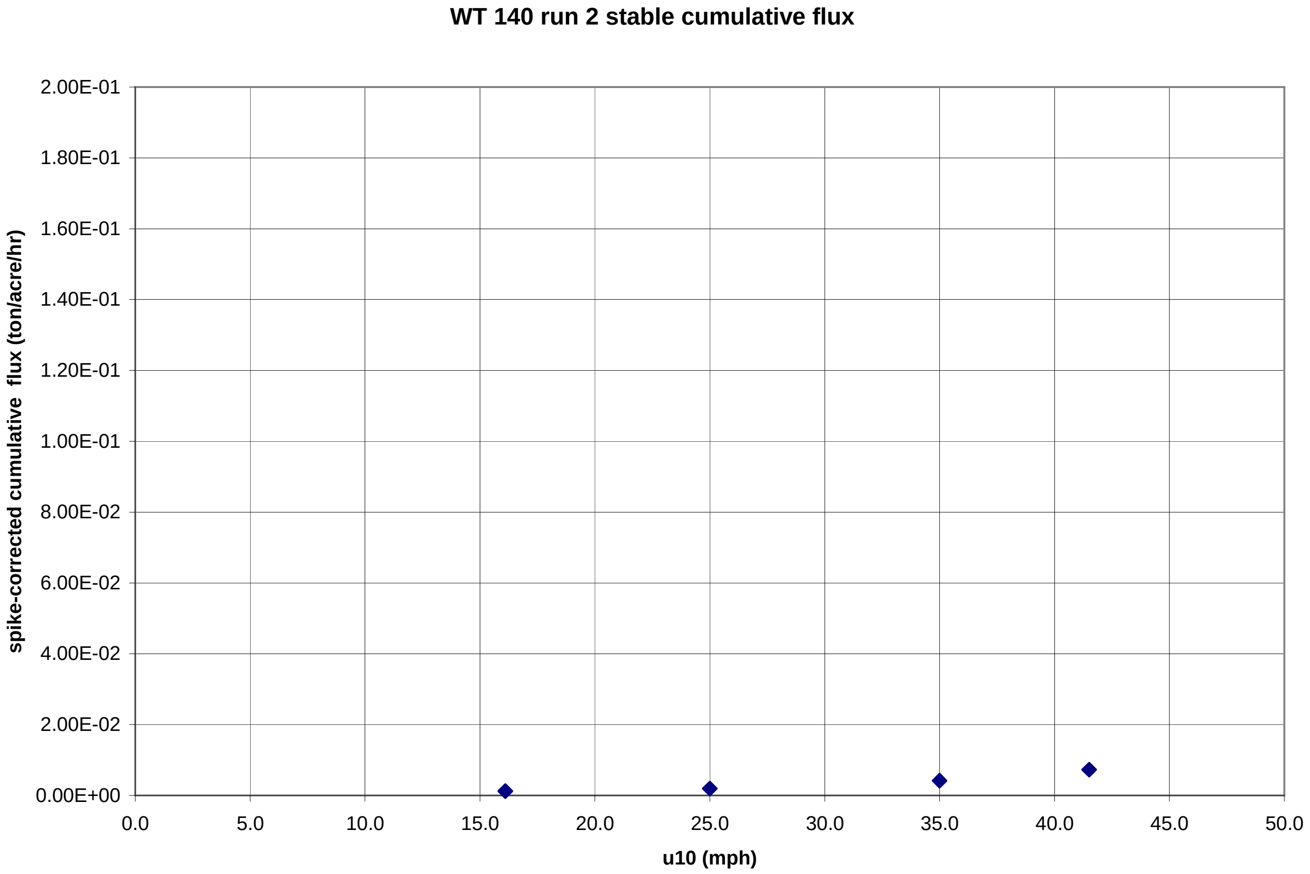
Appendix C (continued)

Figure 167 – U10 versus spike corrected flux – WT 140 1U



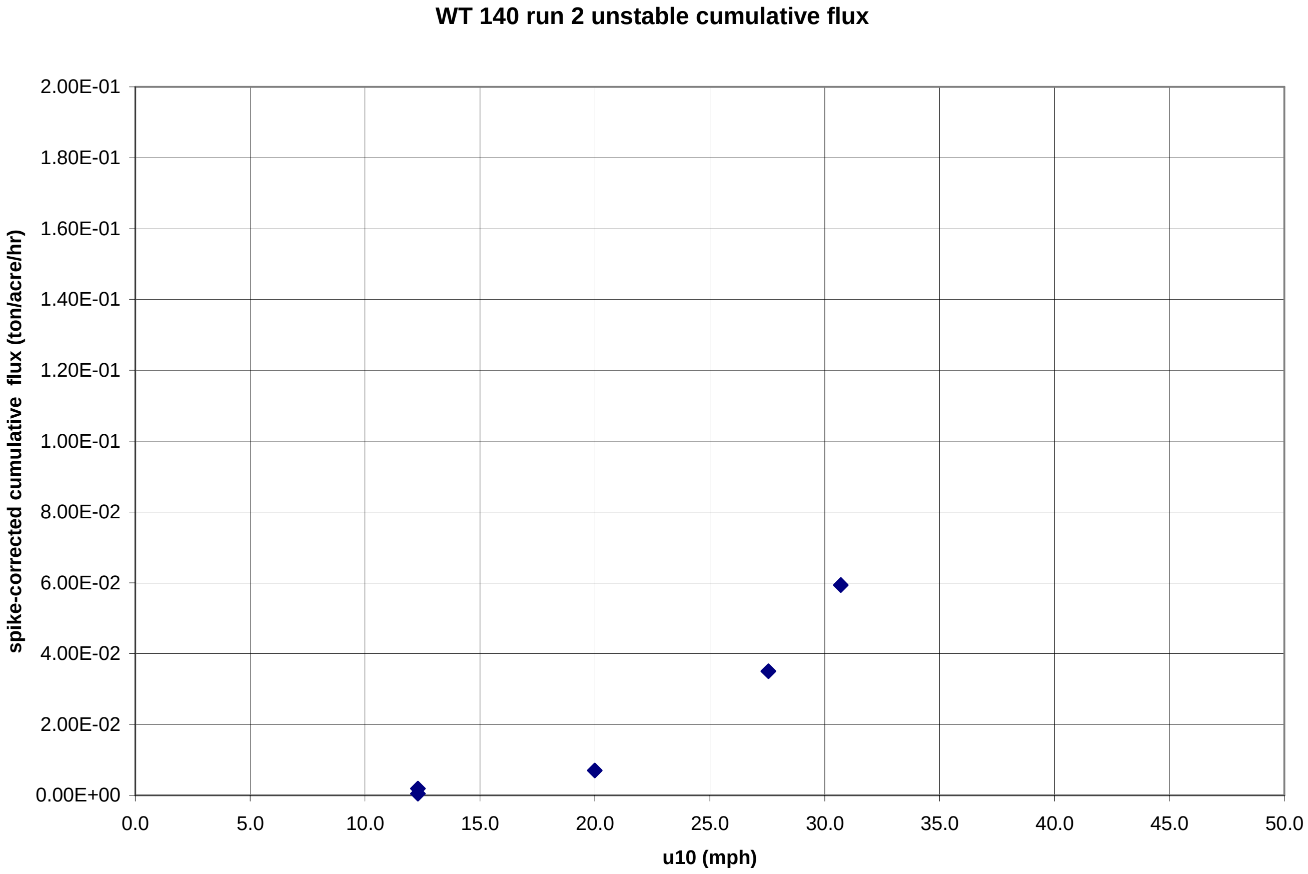
Appendix C (continued)

Figure 168 – U10 versus spike corrected flux – WT 140 2S


WT 140 run 2 stable cumulative flux

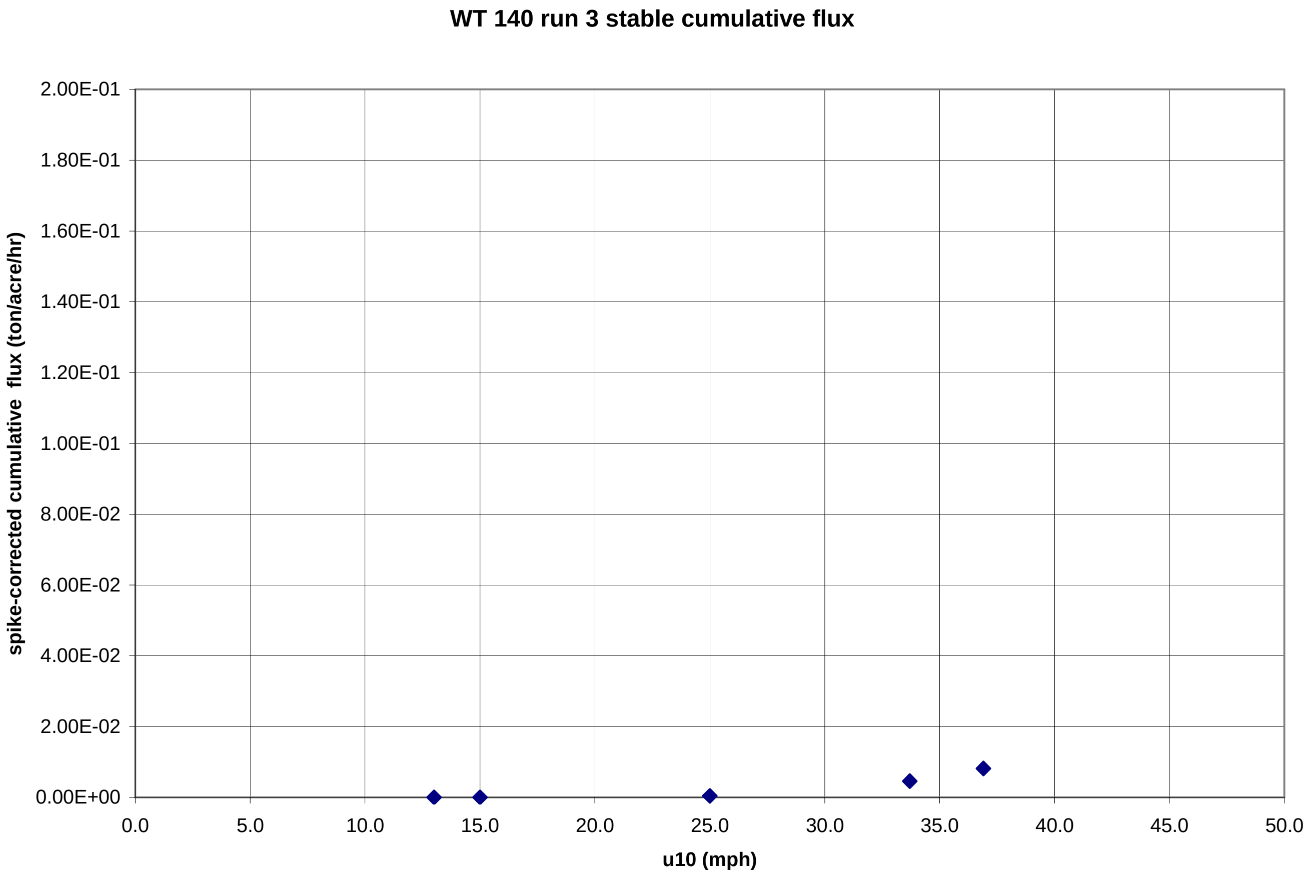
Appendix C (continued)

Figure 169 – U10 versus spike corrected flux – WT 140 2U



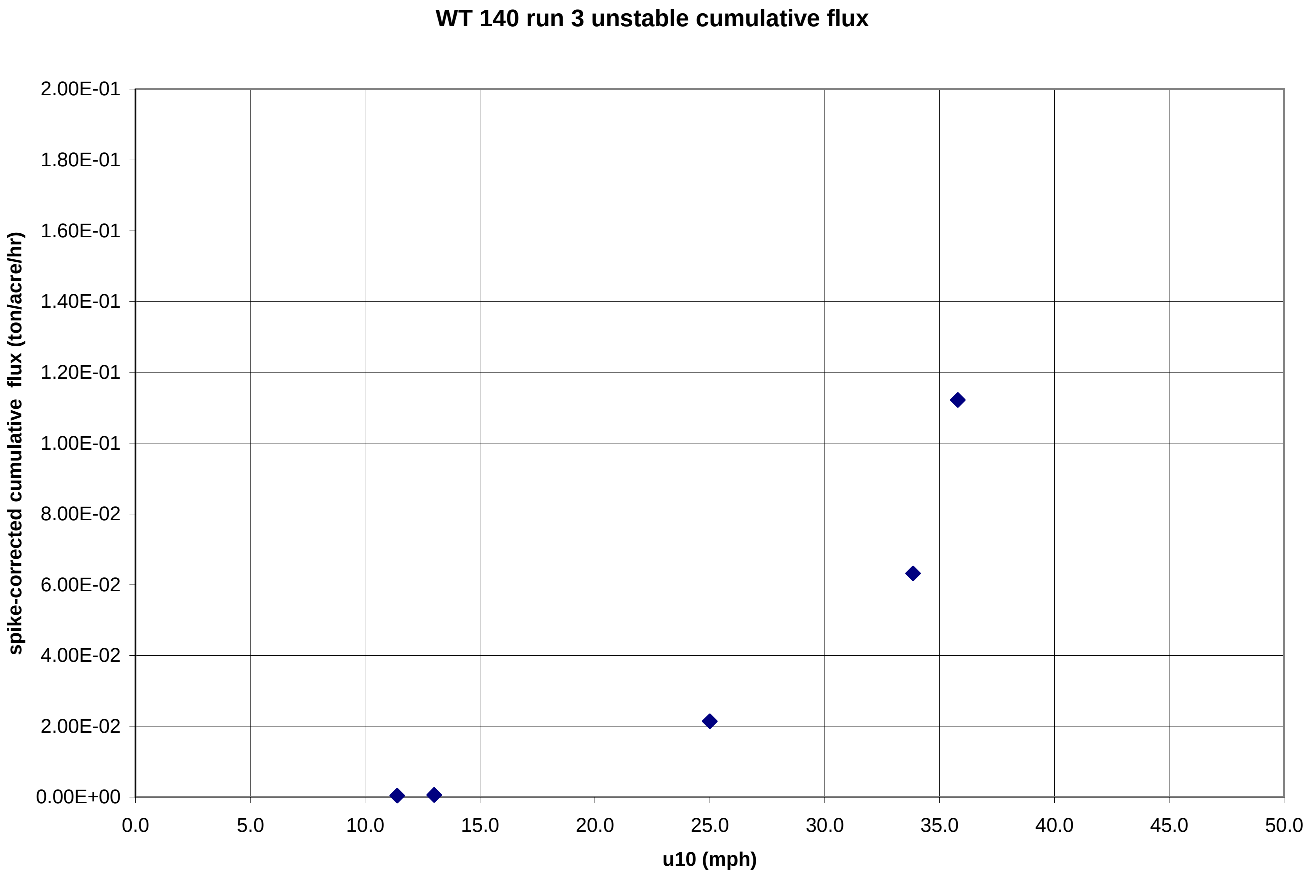
Appendix C (continued)

Figure 170 – U10 versus spike corrected flux – WT 140 3S



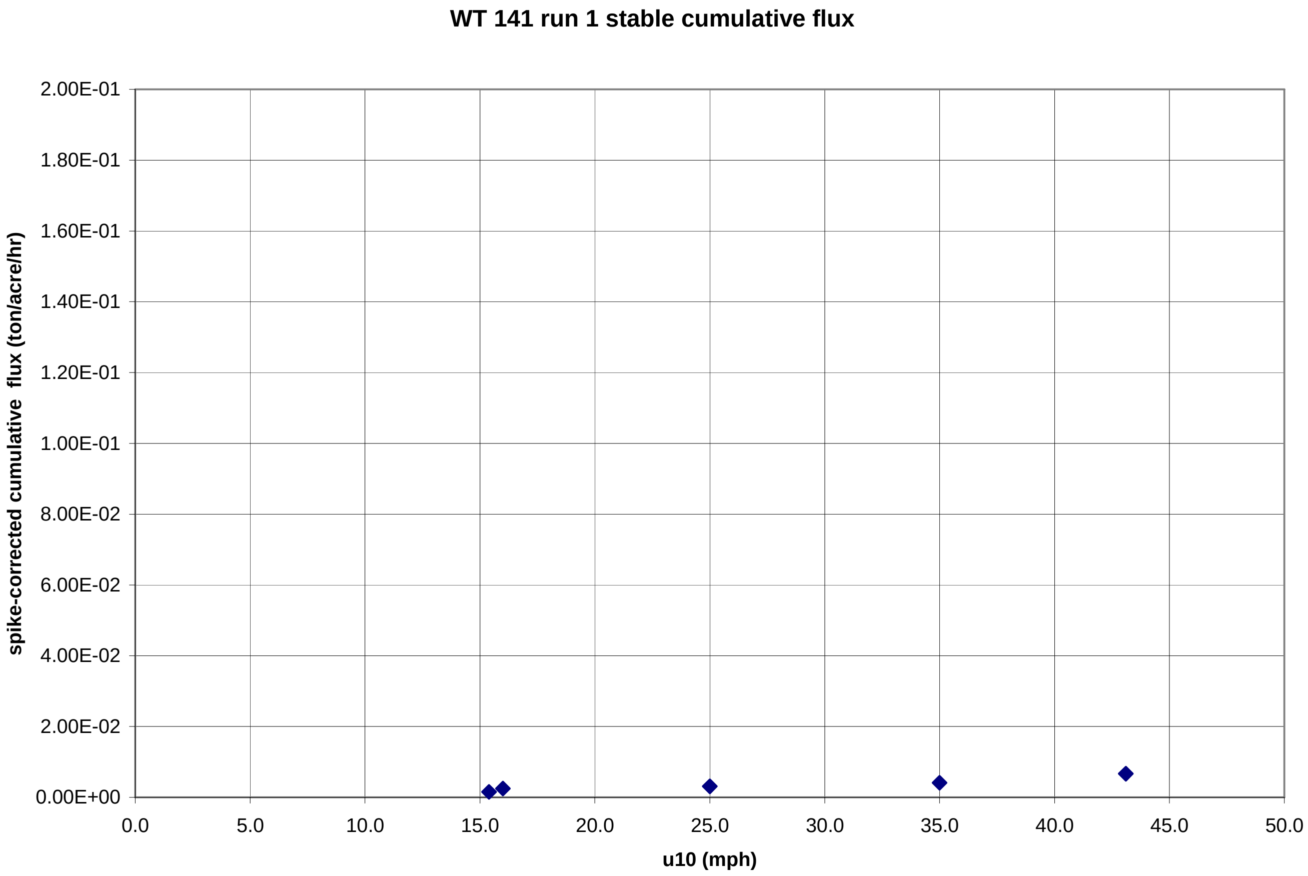
Appendix C (continued)

Figure 171 – U10 versus spike corrected flux – WT 140 3U



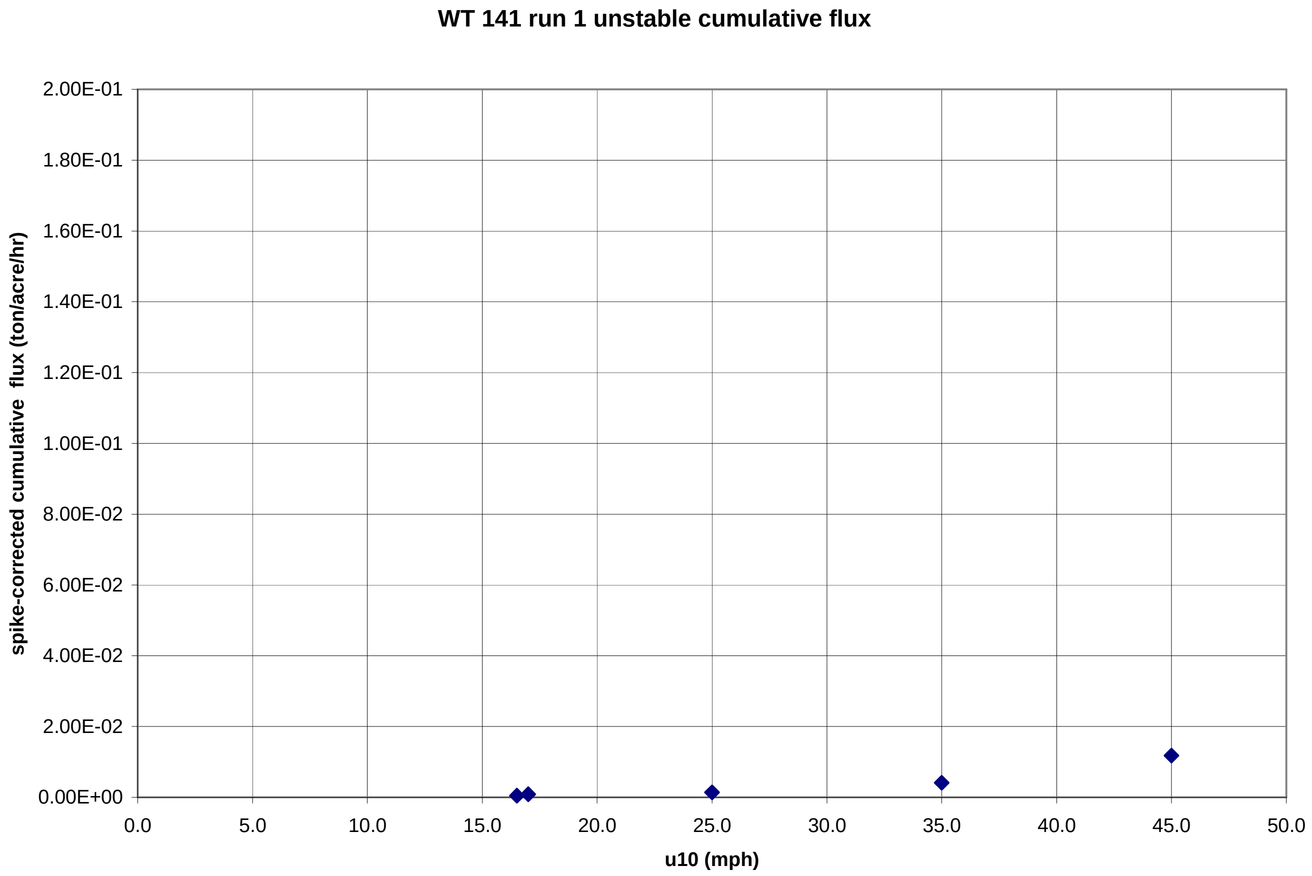
Appendix C (continued)

Figure 172 – U10 versus spike corrected flux – WT 141 1S



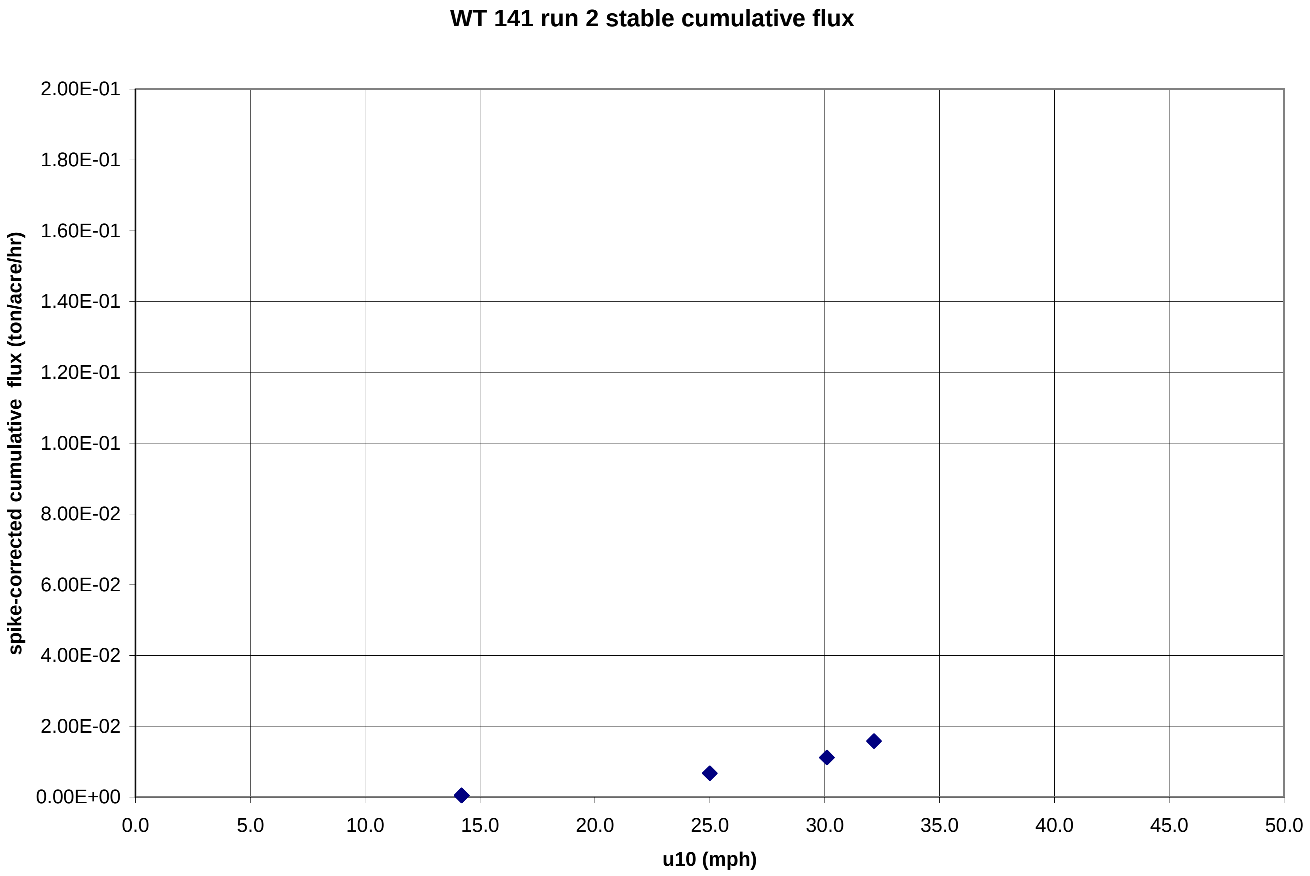
Appendix C (continued)

Figure 173 – U10 versus spike corrected flux – WT 141 1U



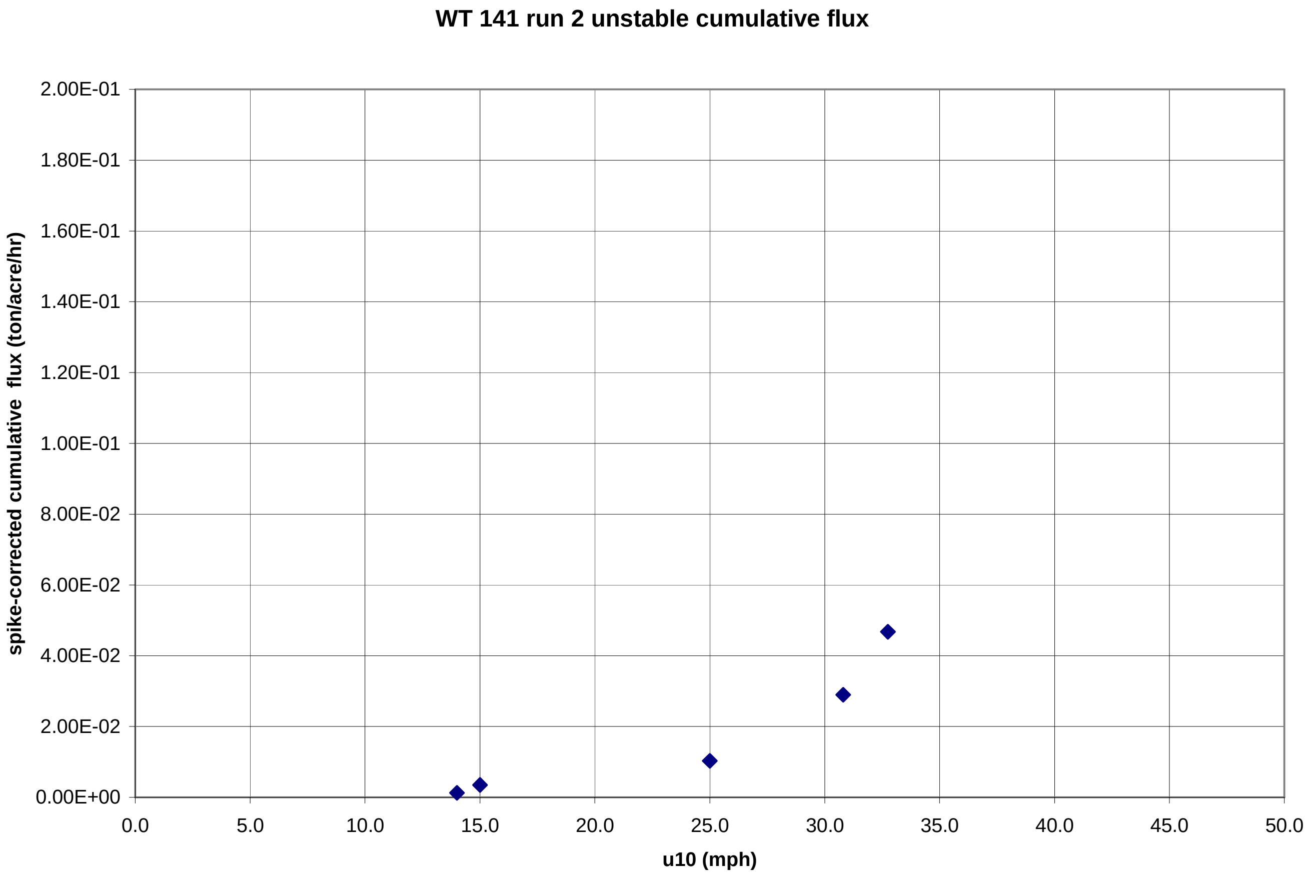
Appendix C (continued)

Figure 174 – U10 versus spike corrected flux – WT 141 2S



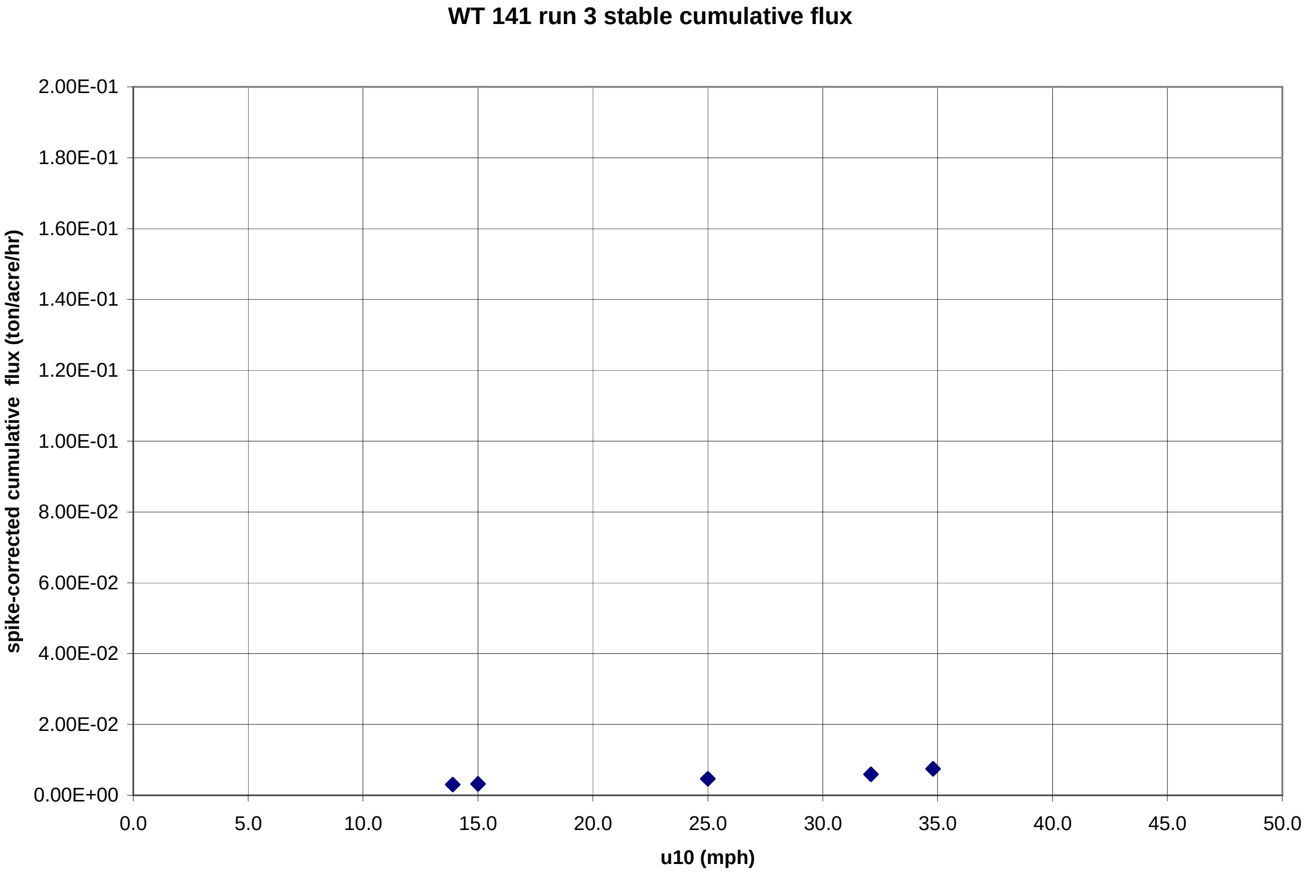
Appendix C (continued)

Figure 175 – U10 versus spike corrected flux – WT 141 2U



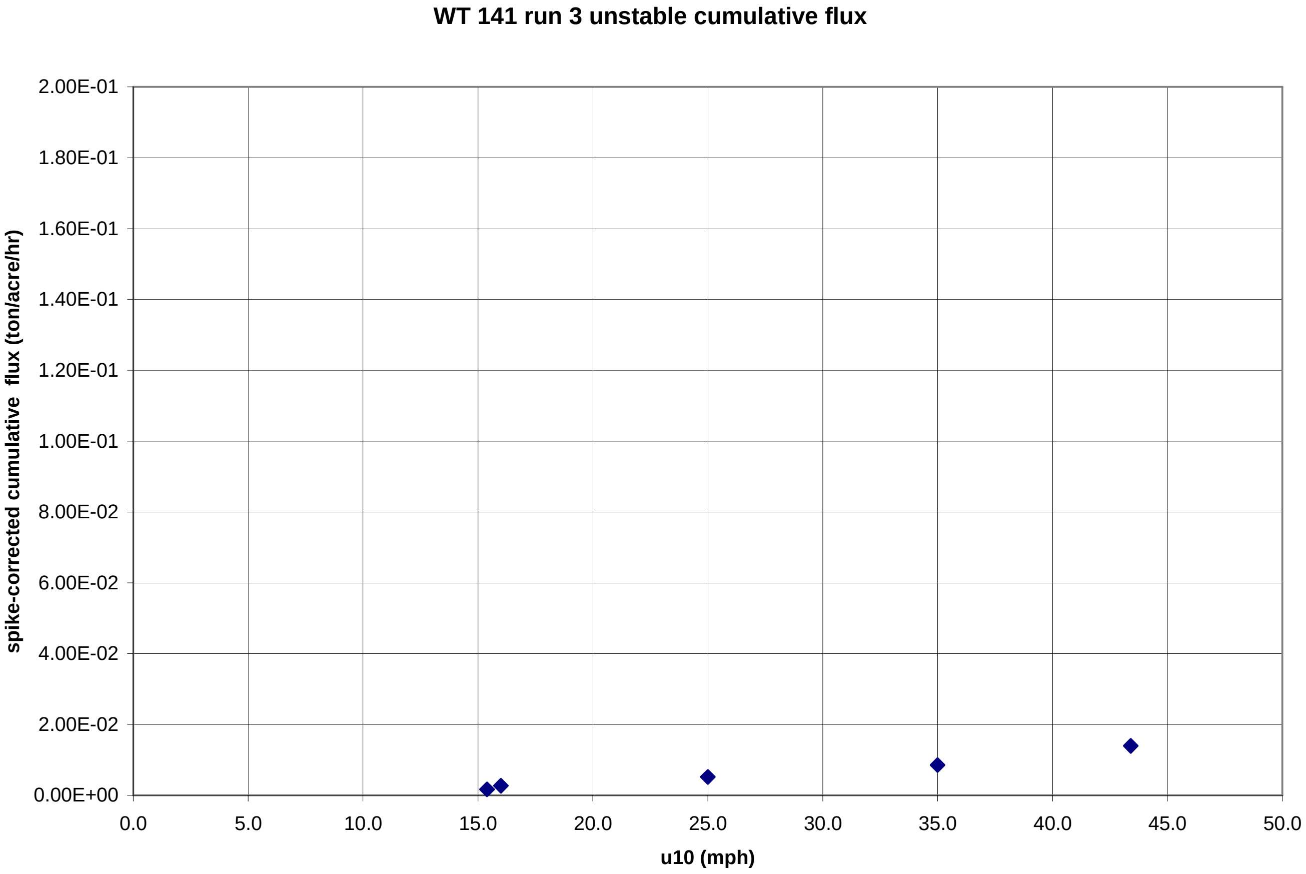
Appendix C (continued)

Figure 176 – U10 versus spike corrected flux – WT 141 3S



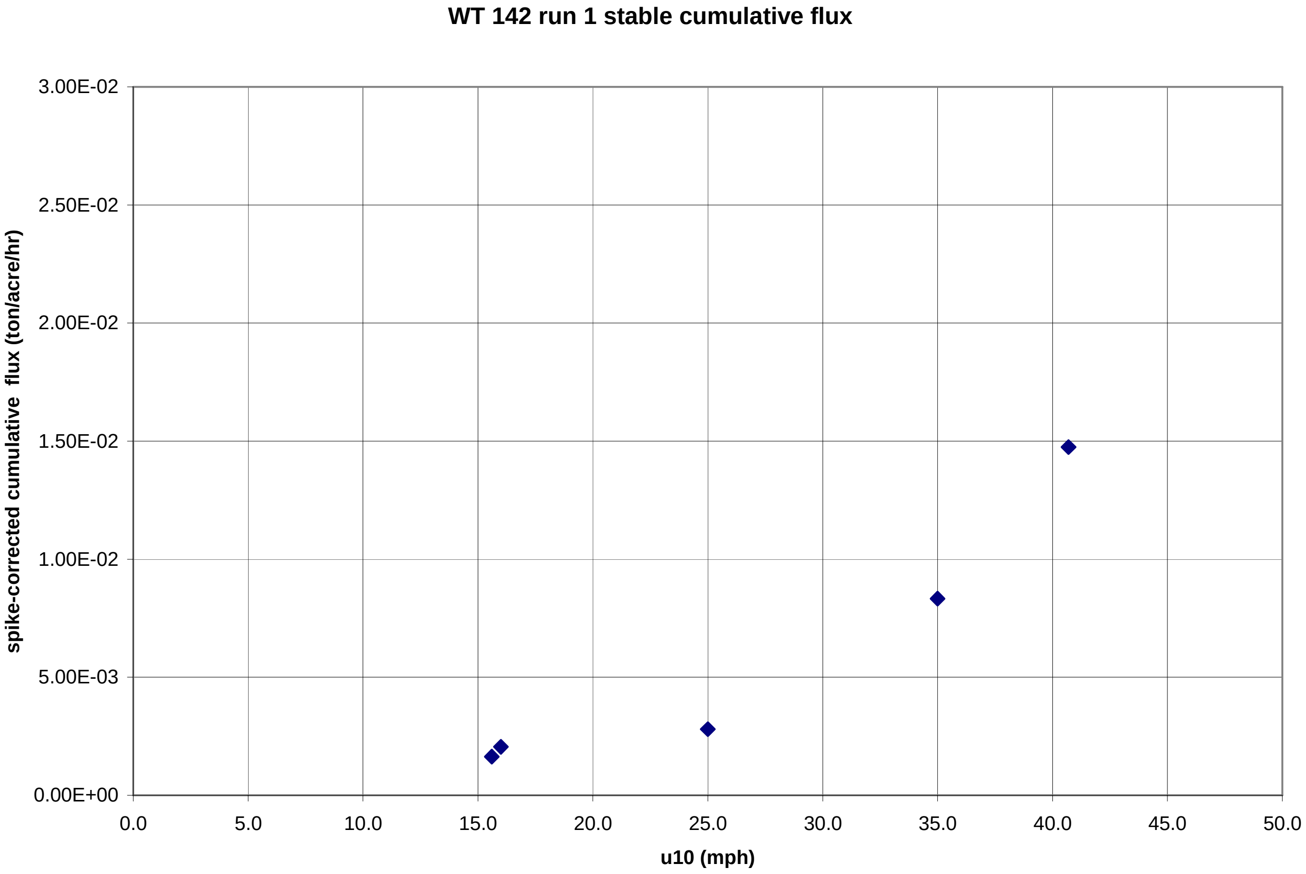
Appendix C (continued)

Figure 177 – U10 versus spike corrected flux – WT 141 3U



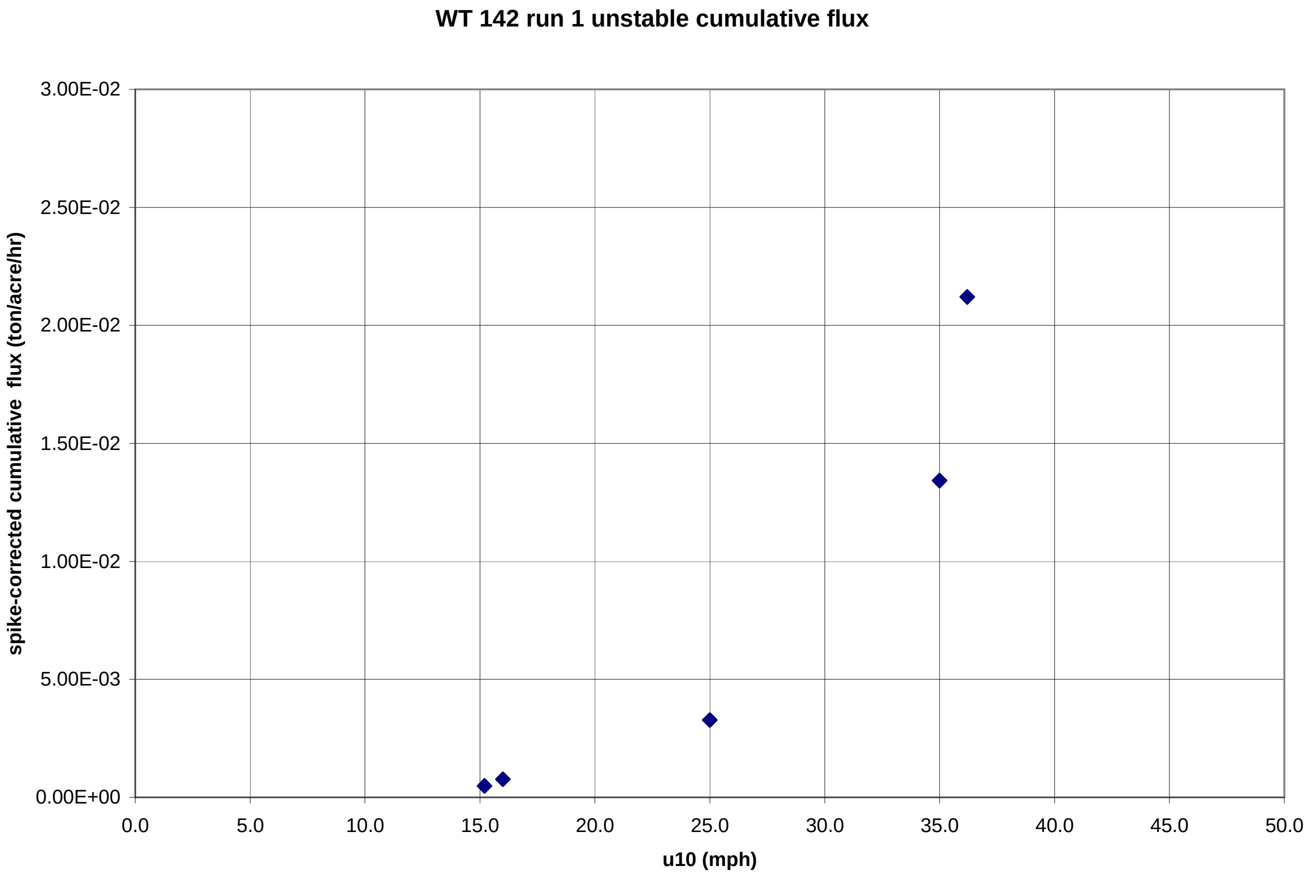
Appendix C (continued)

Figure 178 – U10 versus spike corrected flux – WT 142 1S



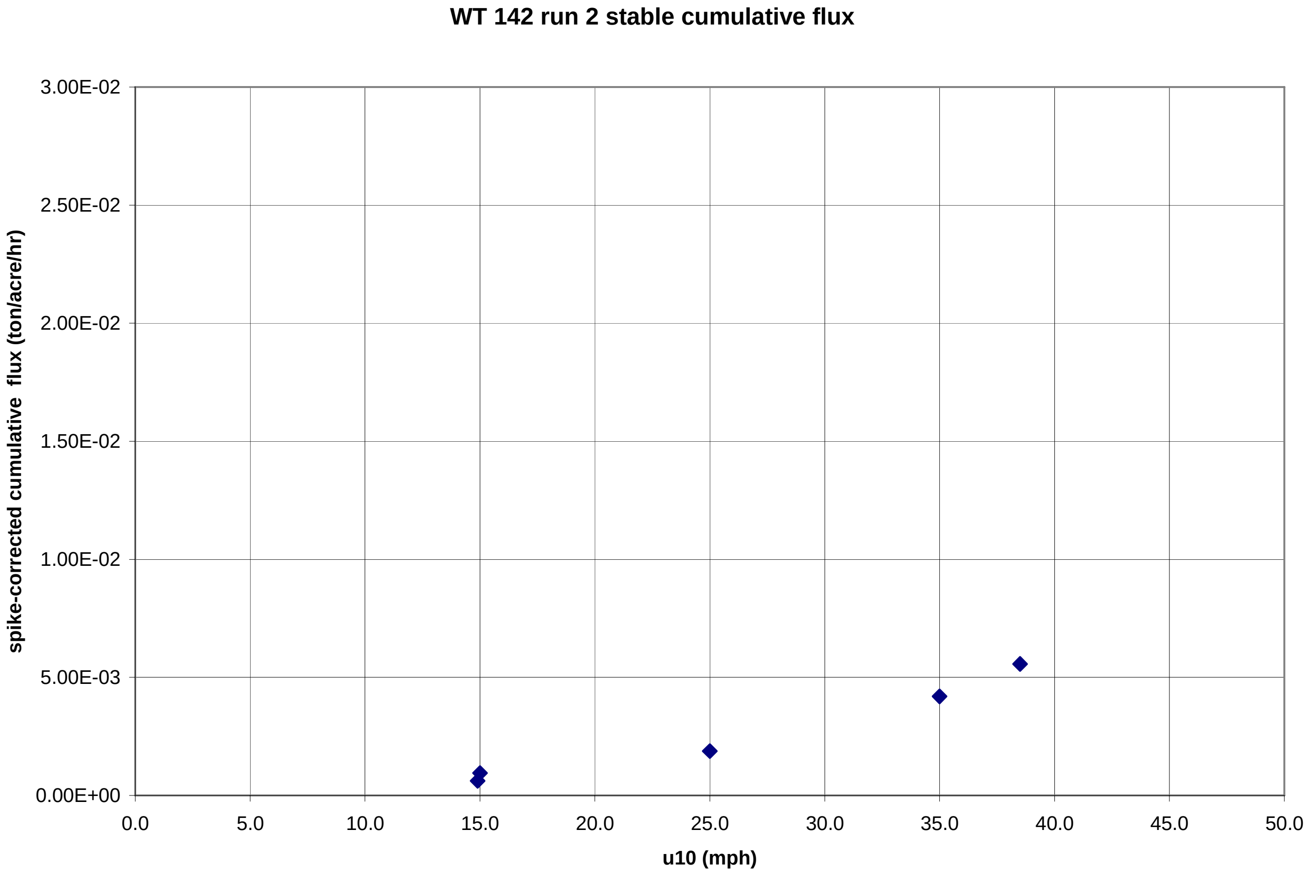
Appendix C (continued)

Figure 179 – U10 versus spike corrected flux – WT 142 1U



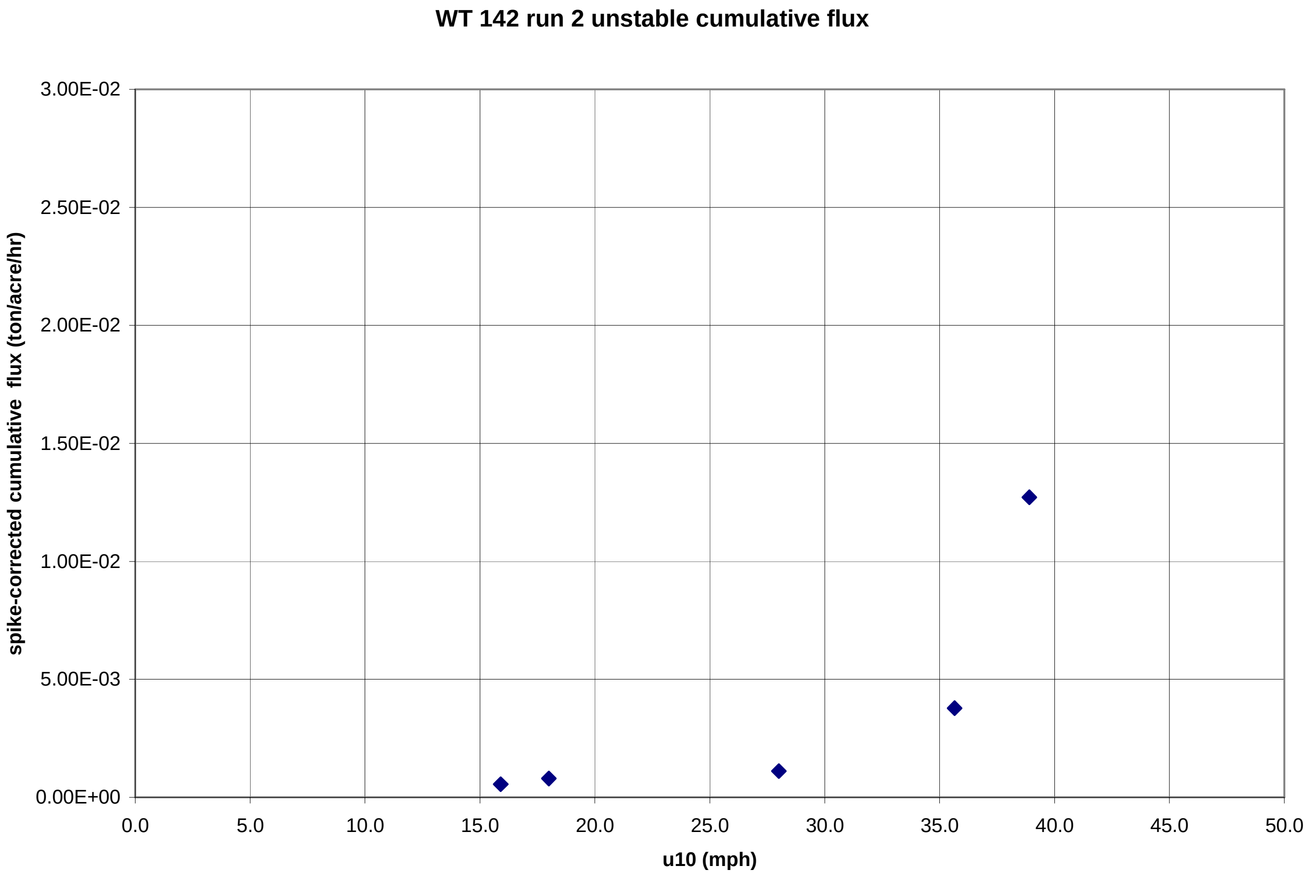
Appendix C (continued)

Figure 180 – U10 versus spike corrected flux – WT 142 2S



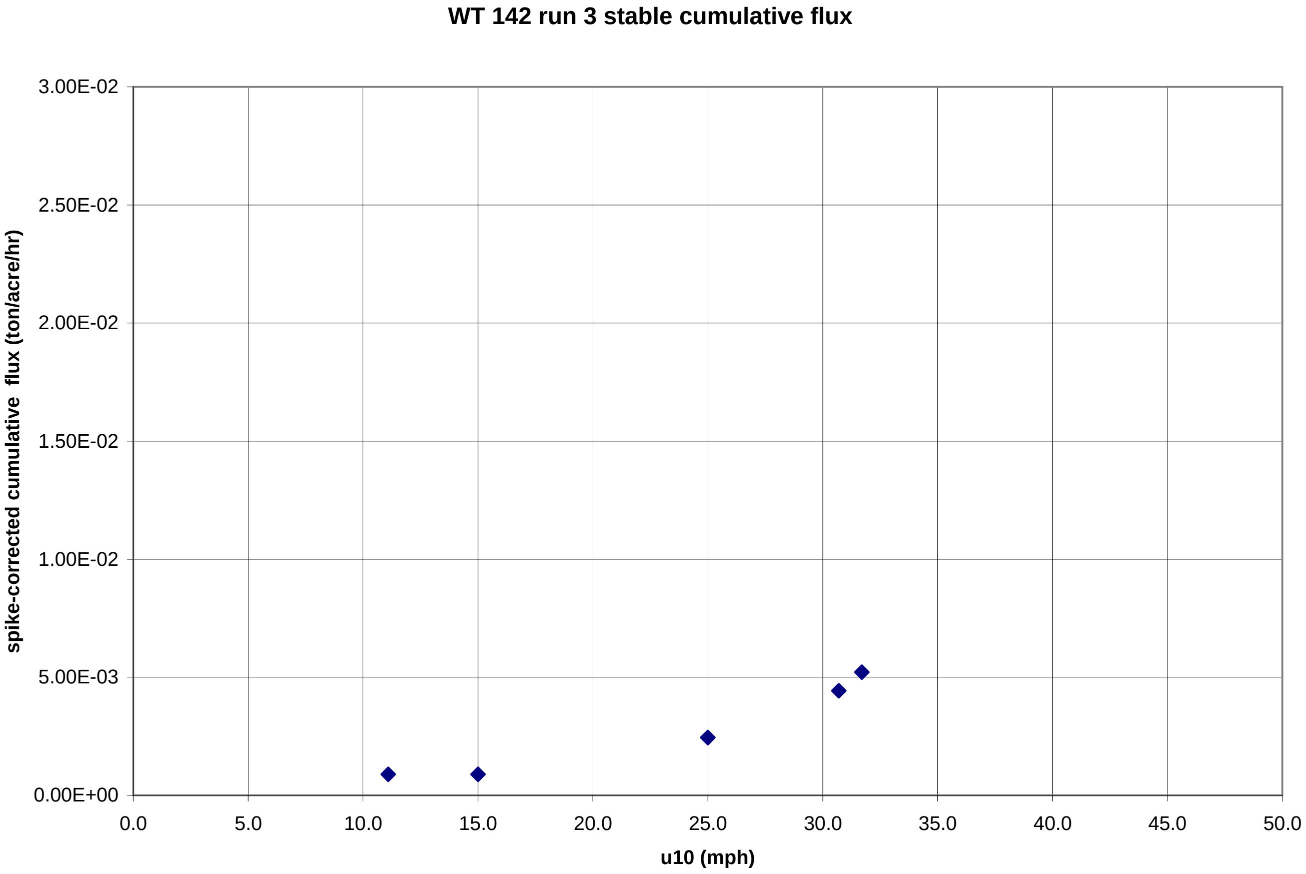
Appendix C (continued)

Figure 181 – U10 versus spike corrected flux – WT 142 2U



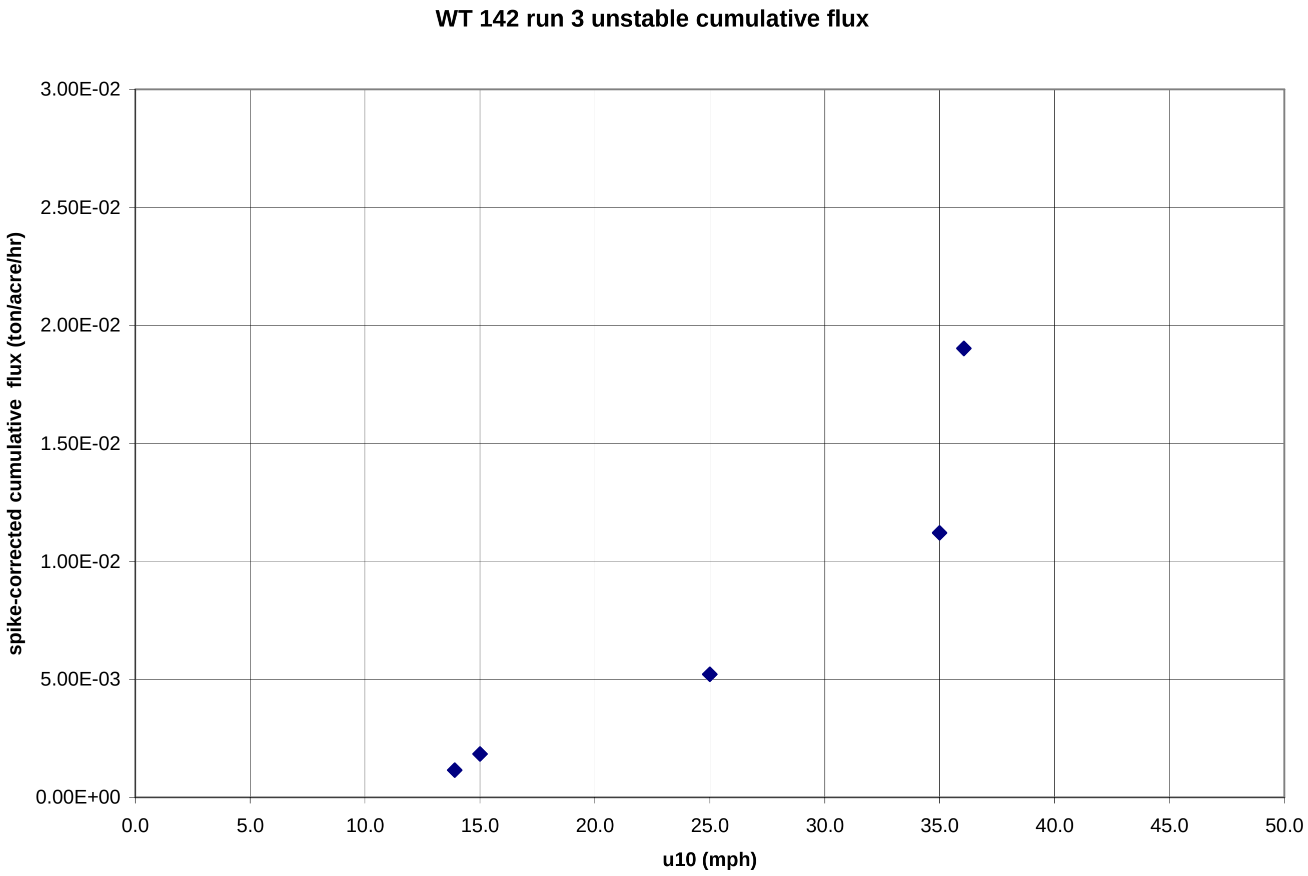
Appendix C (continued)

Figure 182 – U10 versus spike corrected flux – WT 142 3S



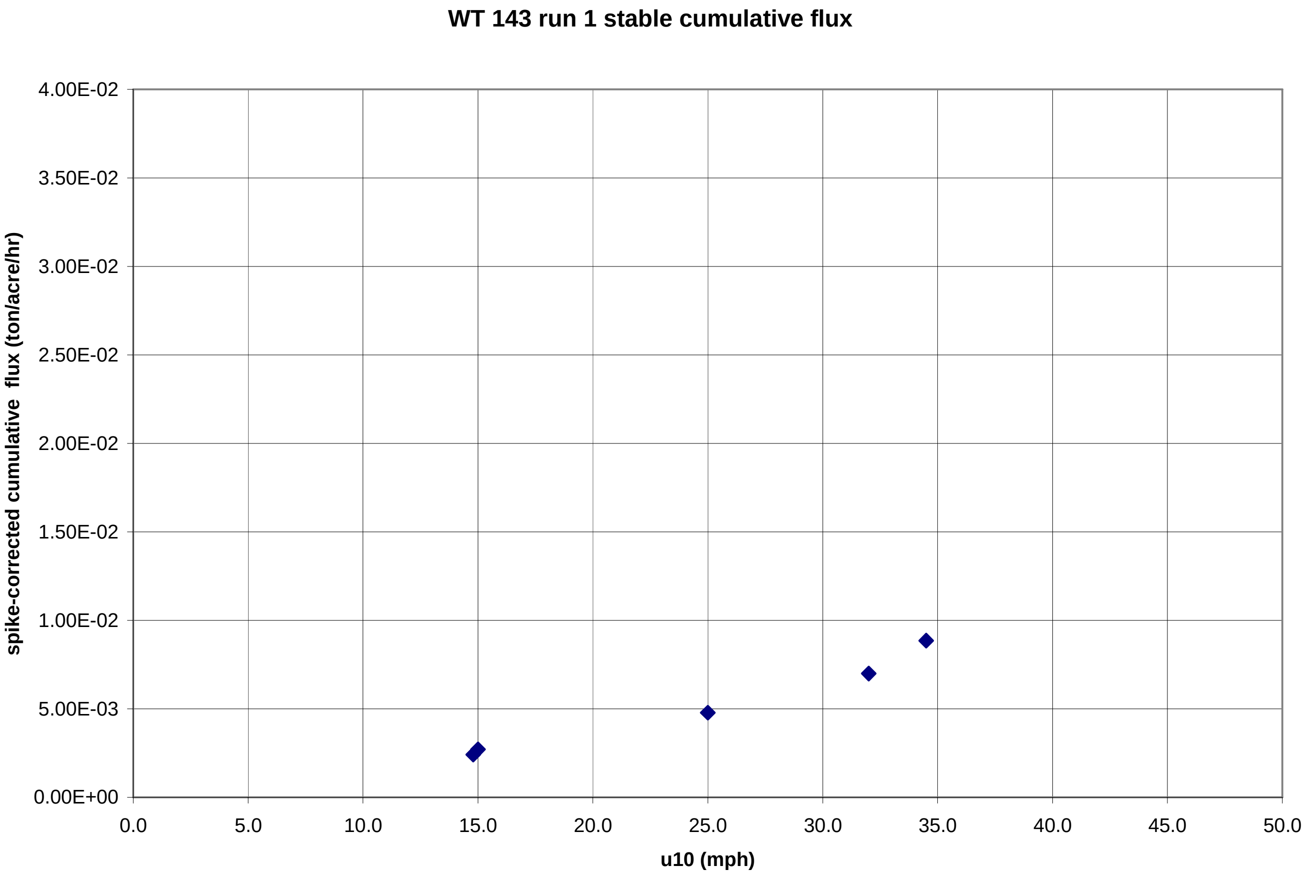
Appendix C (continued)

Figure 183 – U10 versus spike corrected flux – WT 142 3U



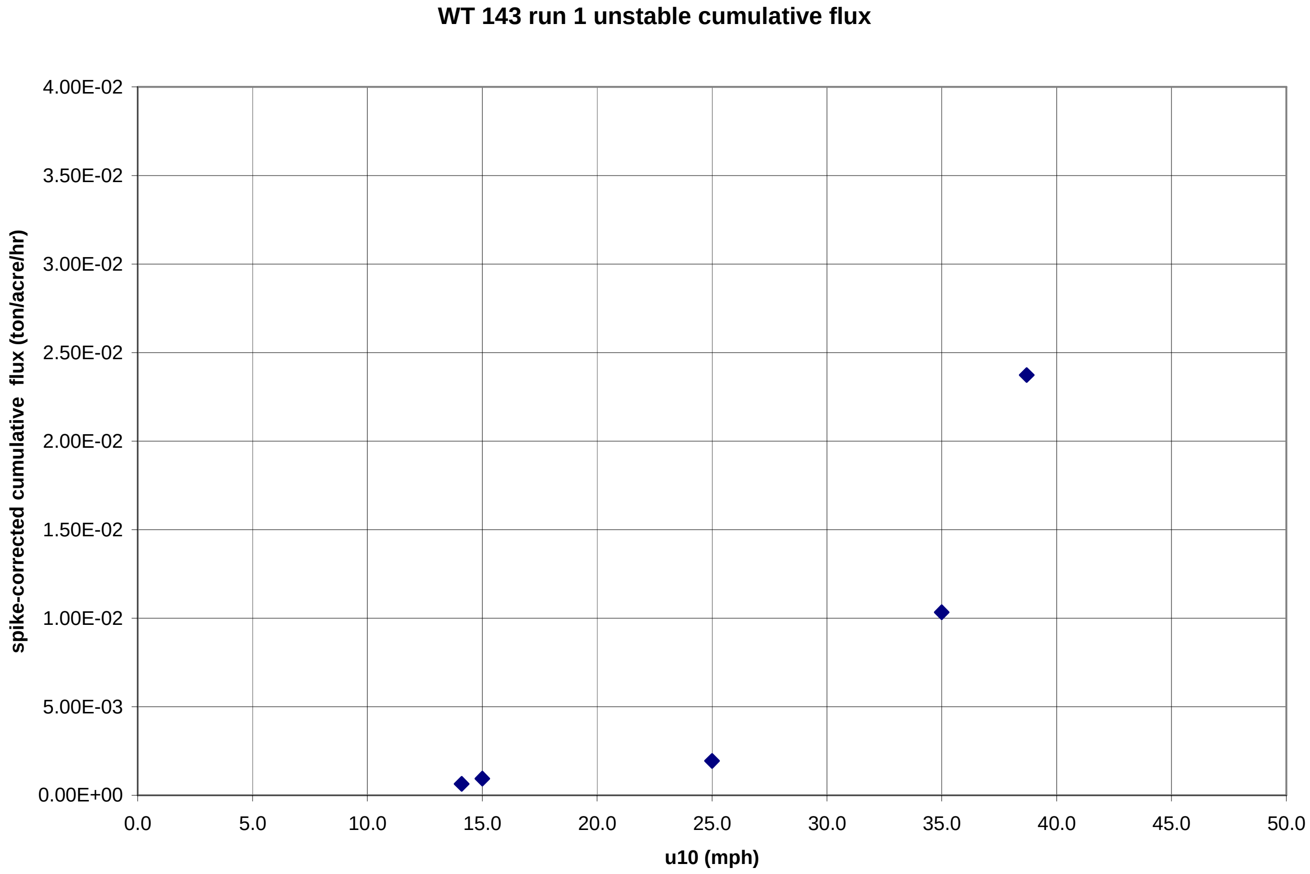
Appendix C (continued)

Figure 184 – U10 versus spike corrected flux – WT 143 1S



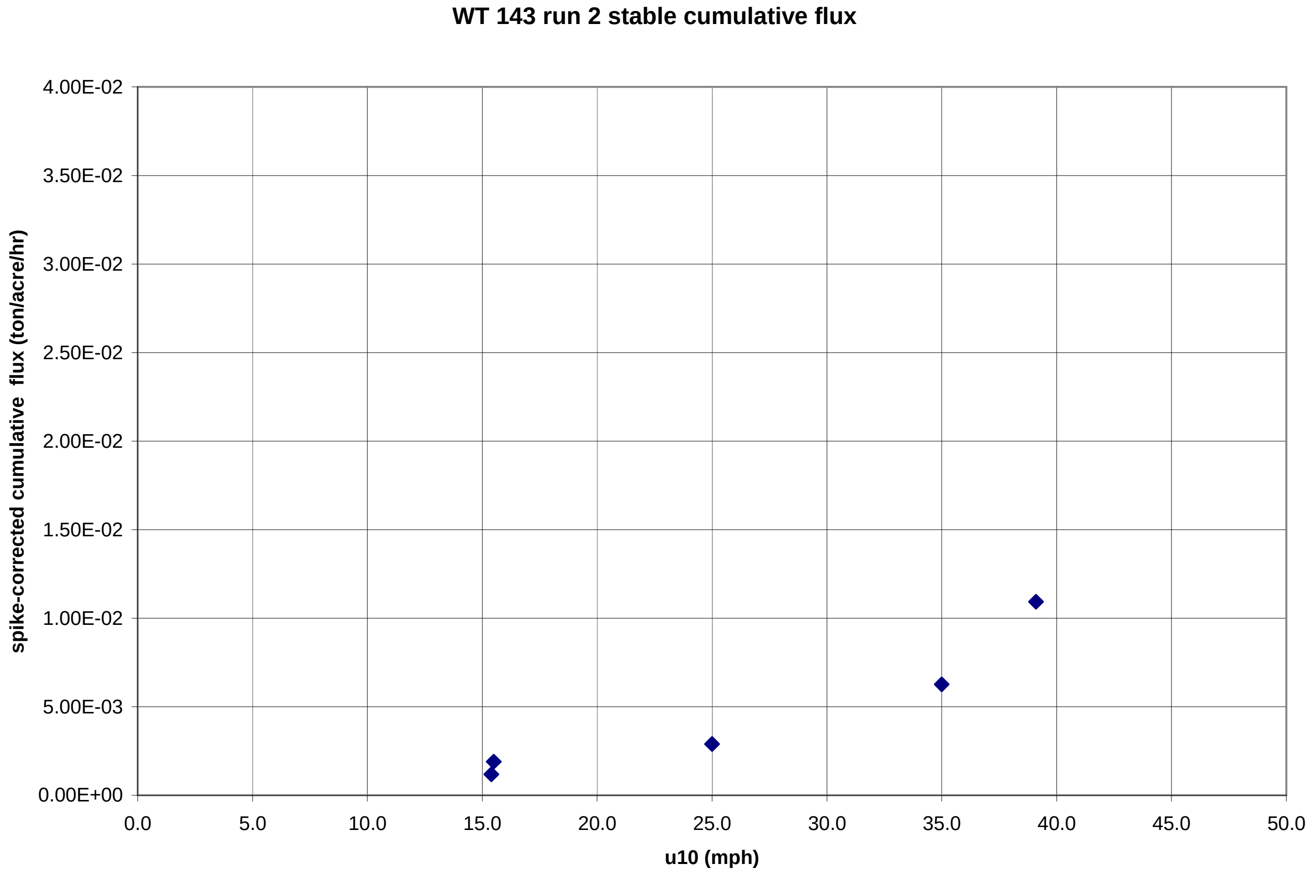
Appendix C (continued)

Figure 185 – U10 versus spike corrected flux – WT 143 1U



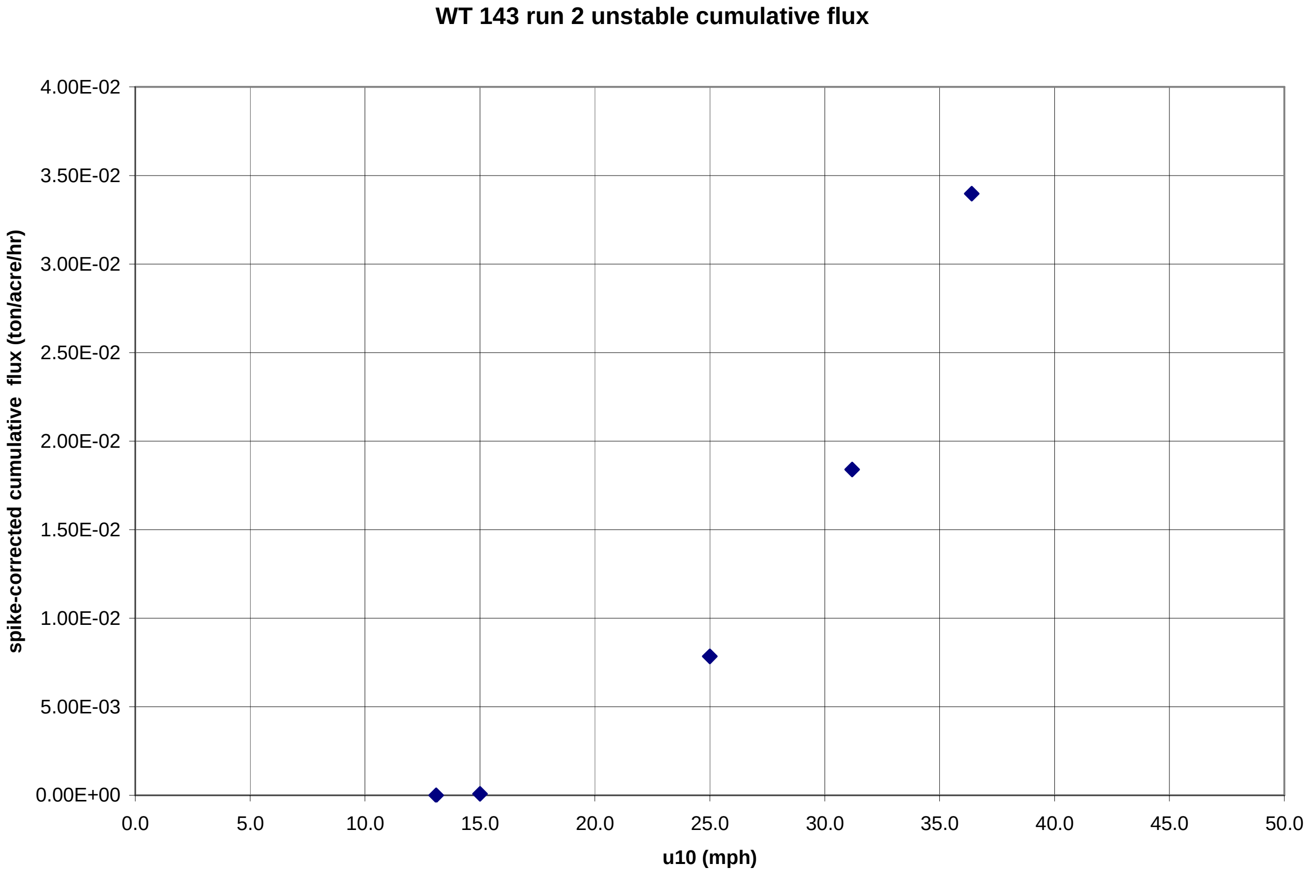
Appendix C (continued)

Figure 186 – U10 versus spike corrected flux – WT 143 2S



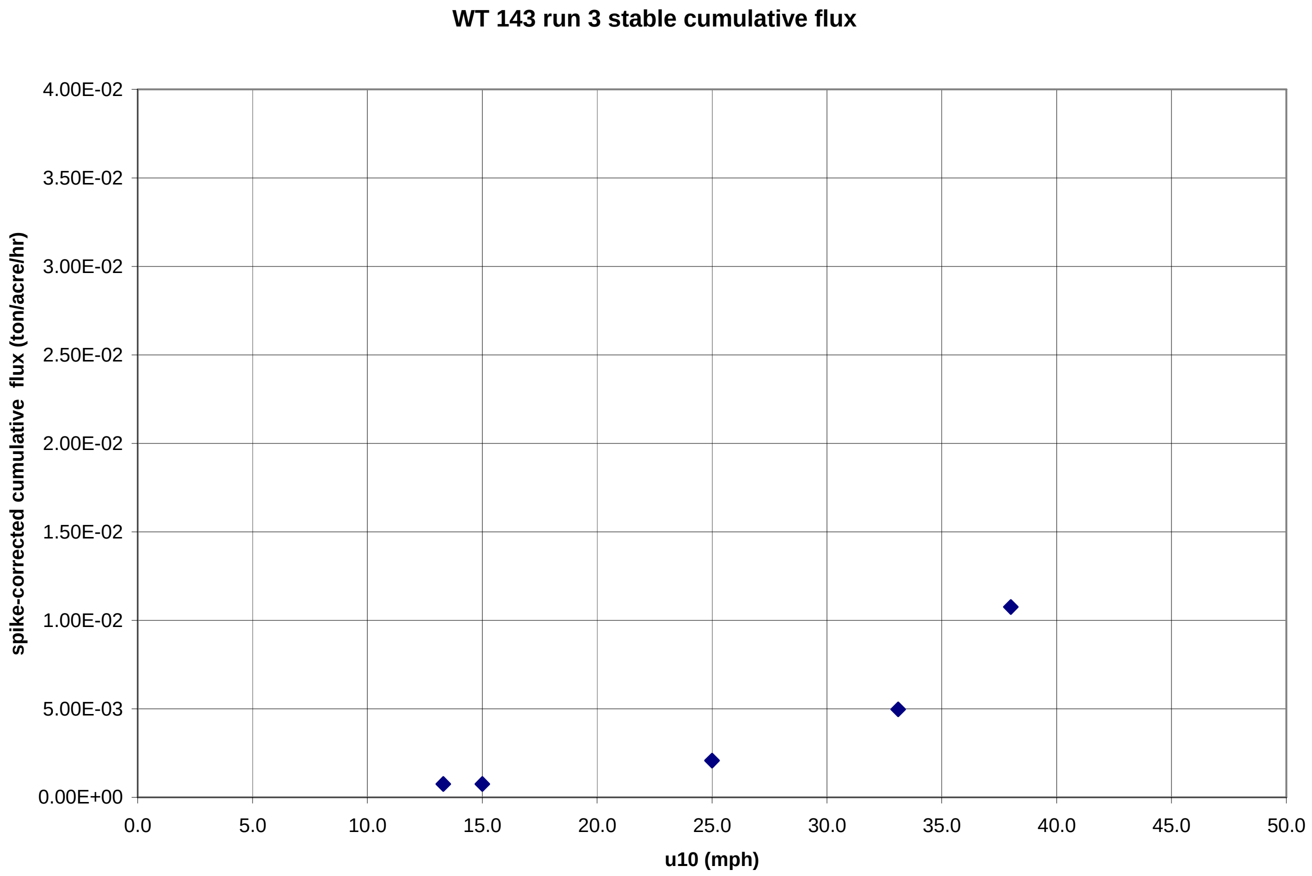
Appendix C (continued)

Figure 187 – U10 versus spike corrected flux – WT 143 2U



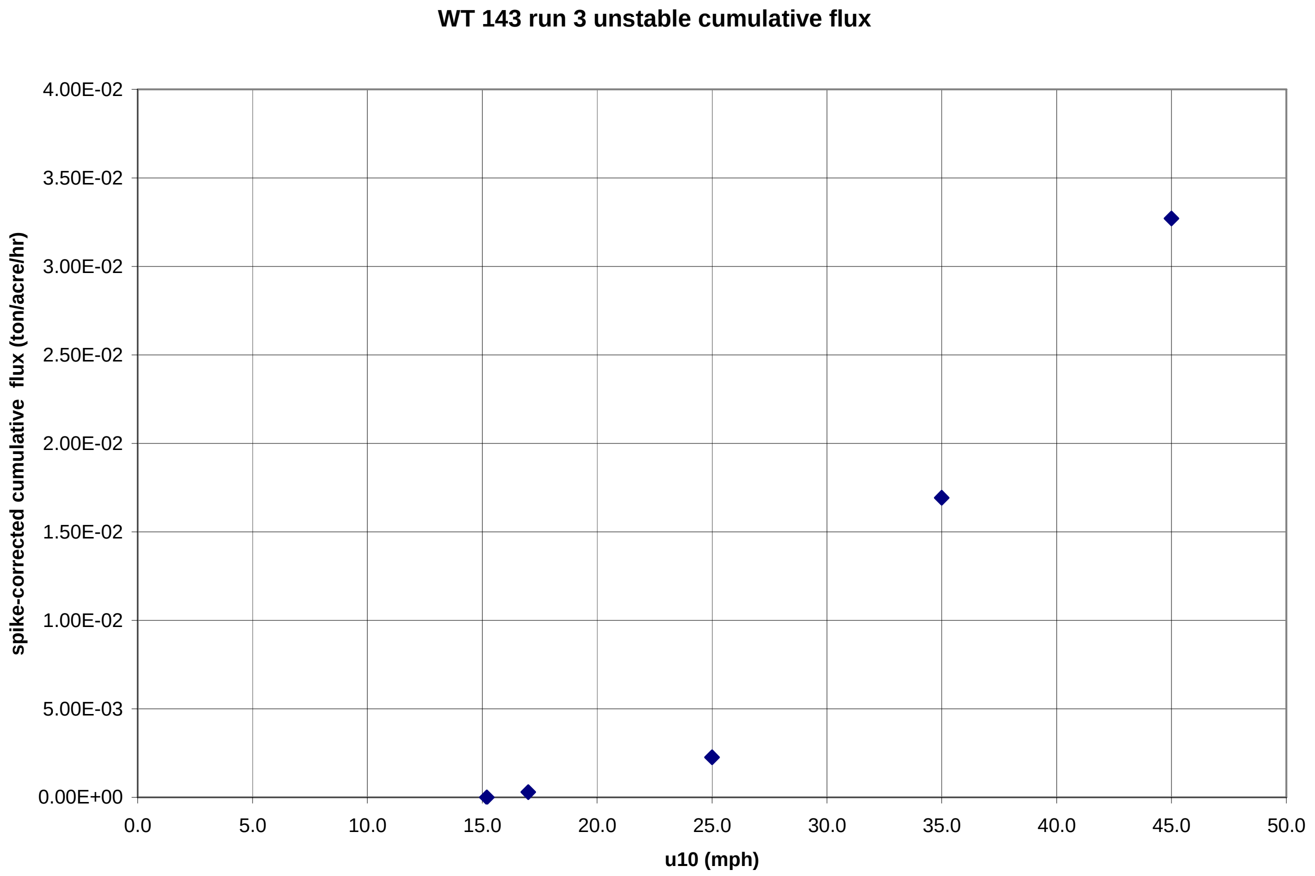
Appendix C (continued)

Figure 188 – U10 versus spike corrected flux – WT 143 3S



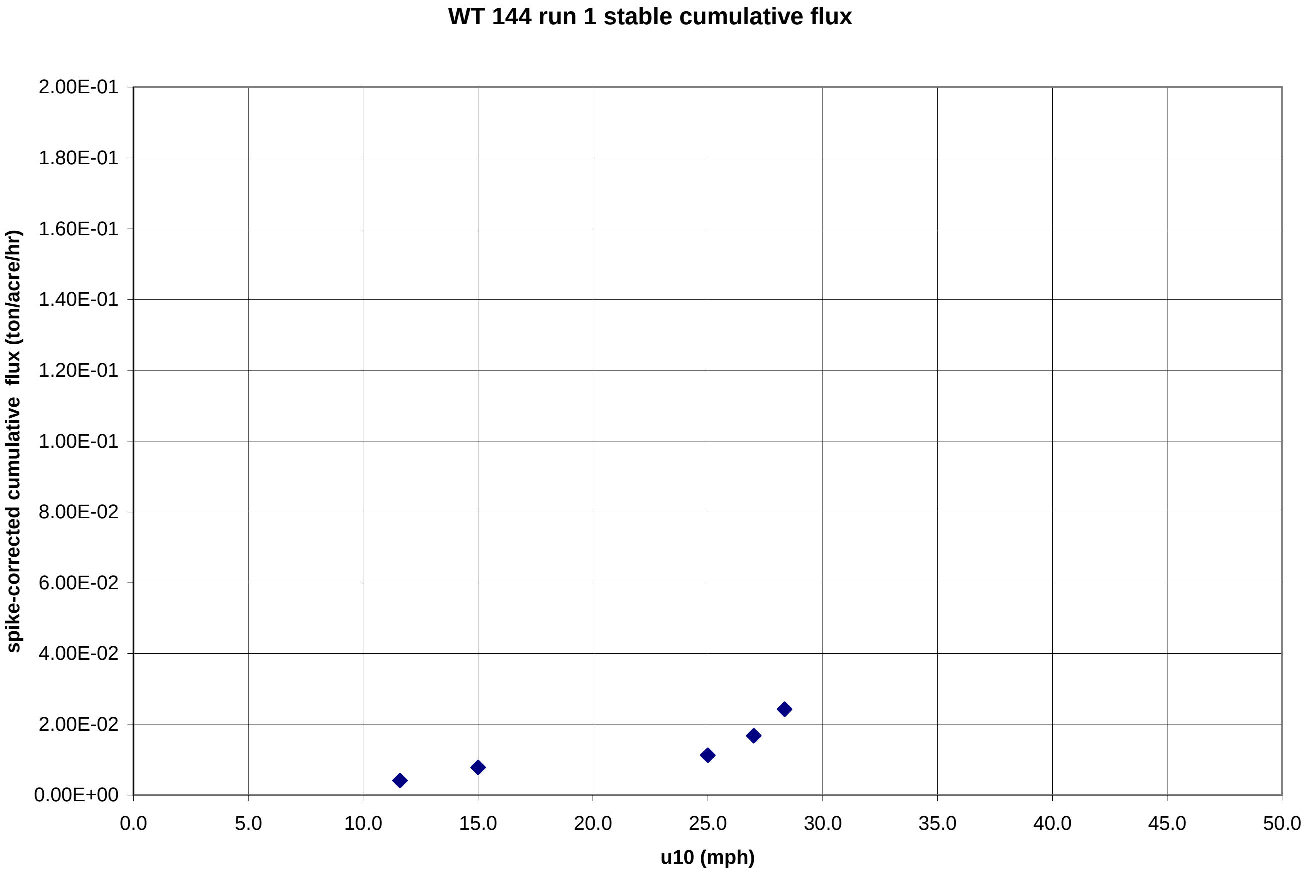
Appendix C (continued)

Figure 189 – U10 versus spike corrected flux – WT 143 3U



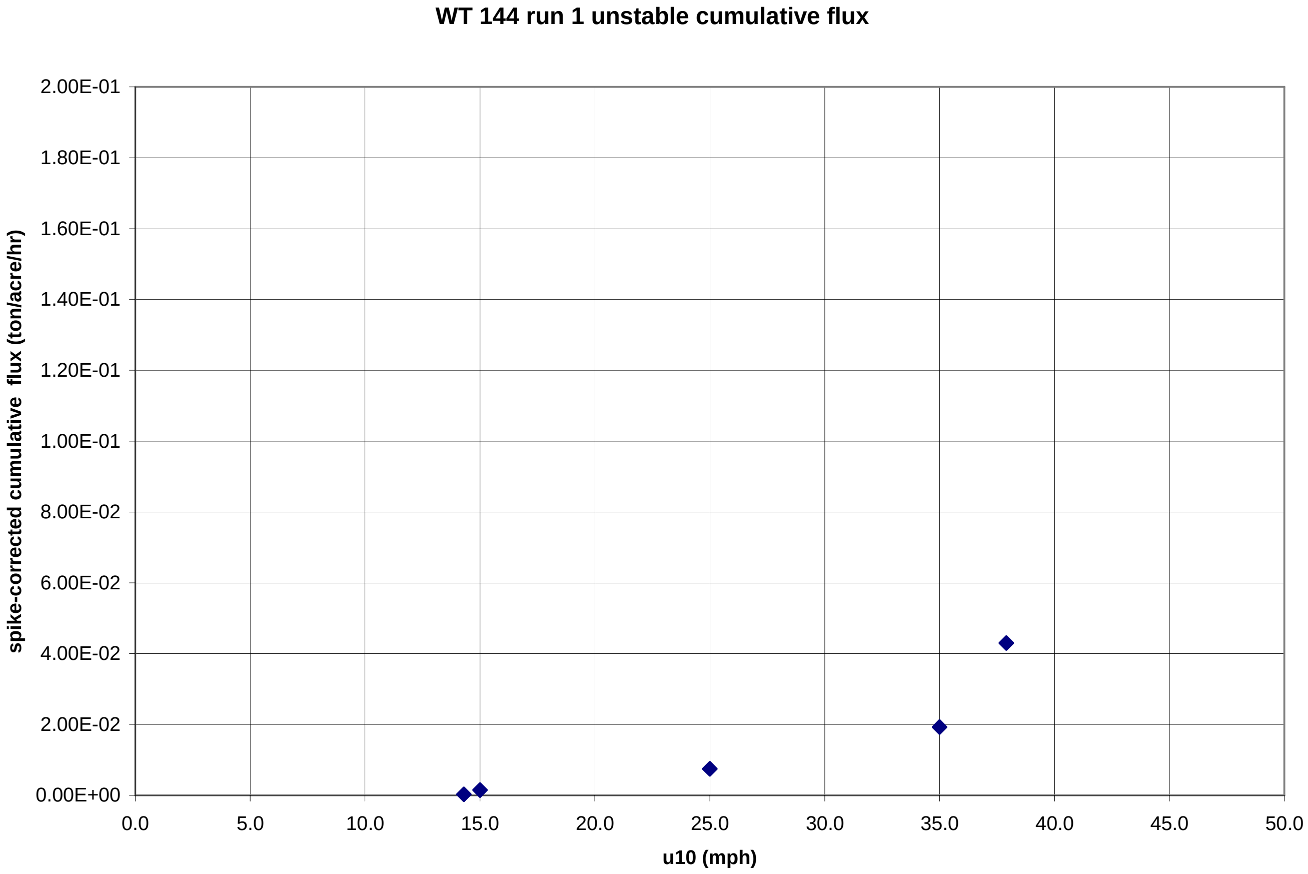
Appendix C (continued)

Figure 190 – U10 versus spike corrected flux – WT 144 1S



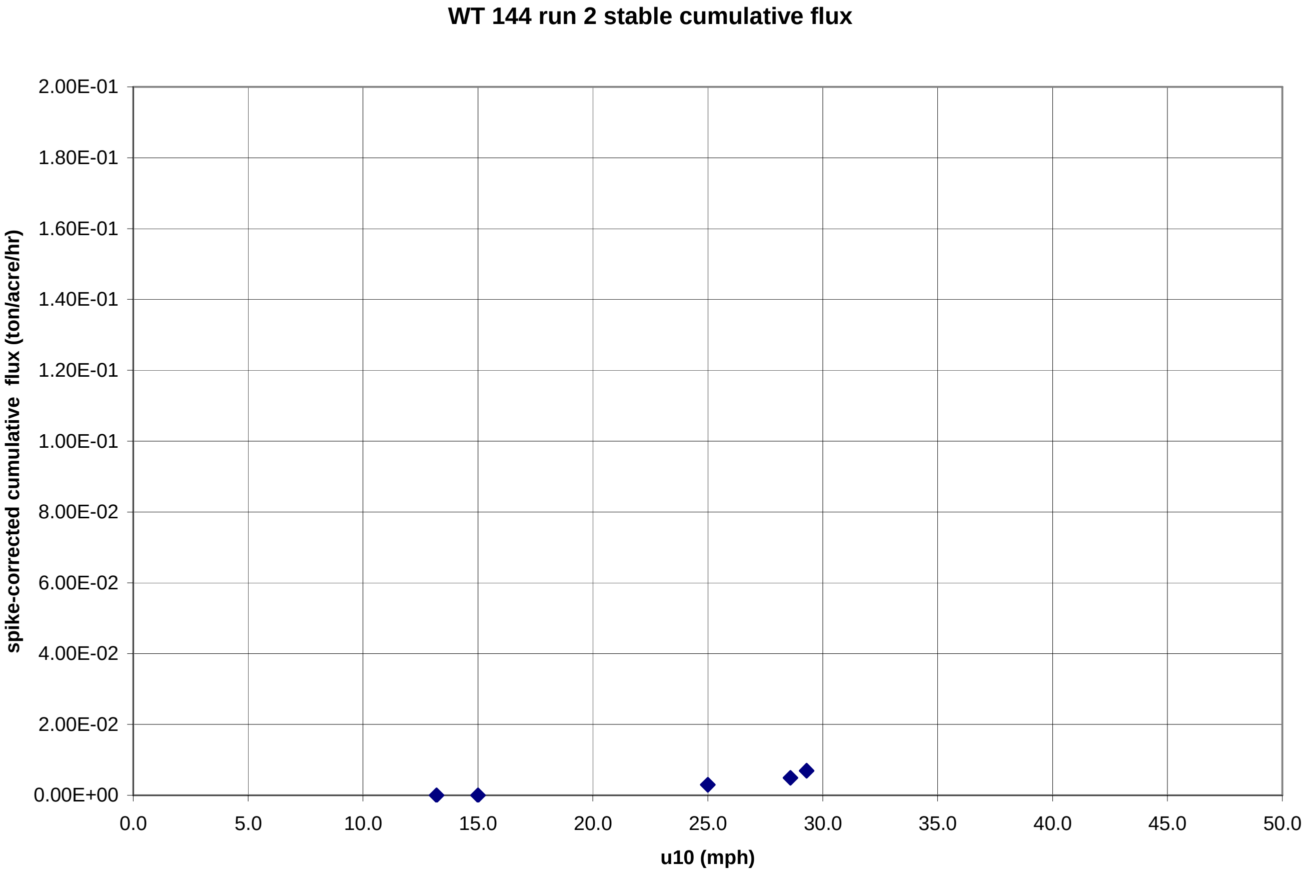
Appendix C (continued)

Figure 191 – U10 versus spike corrected flux – WT 144 1U



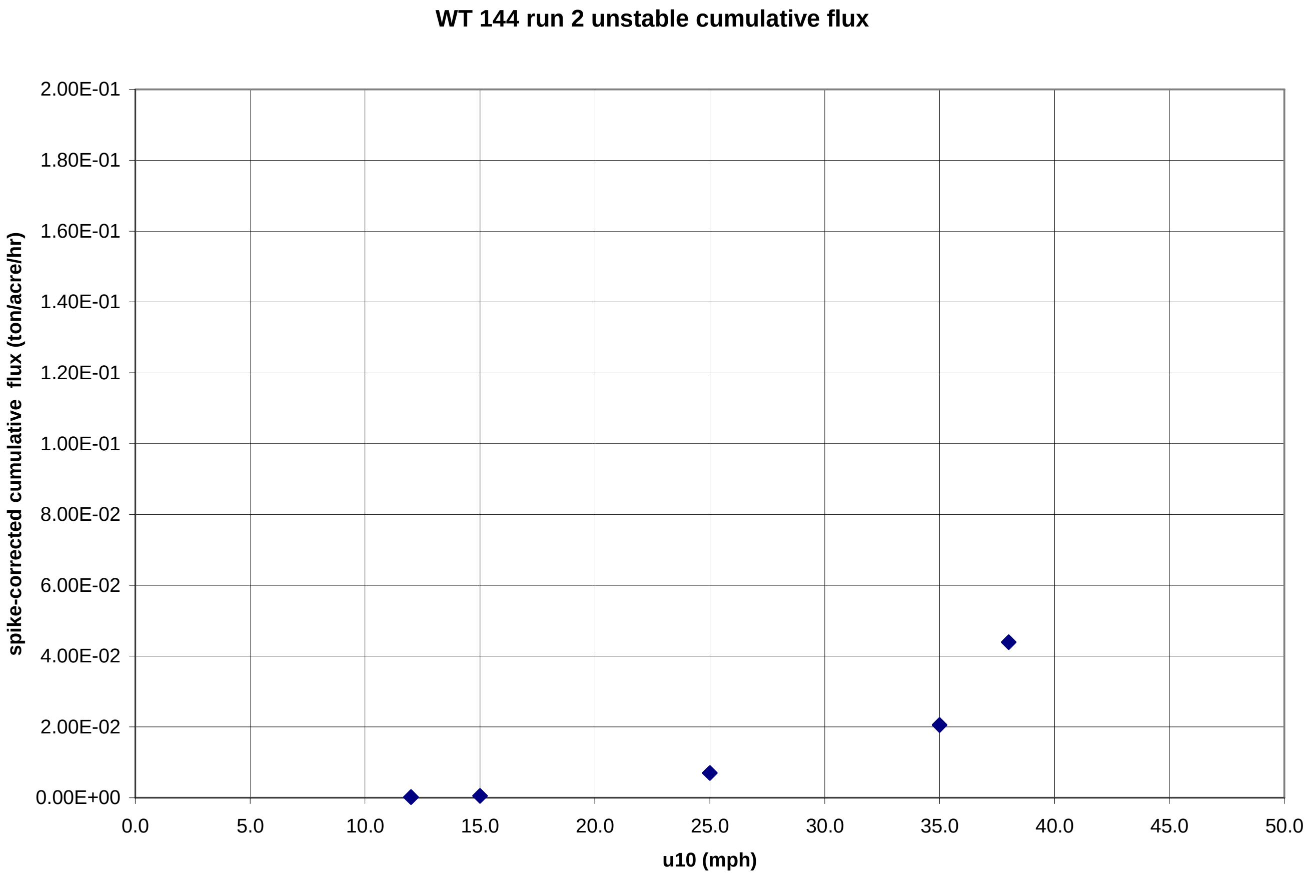
Appendix C (continued)

Figure 192 – U10 versus spike corrected flux – WT 144 2S



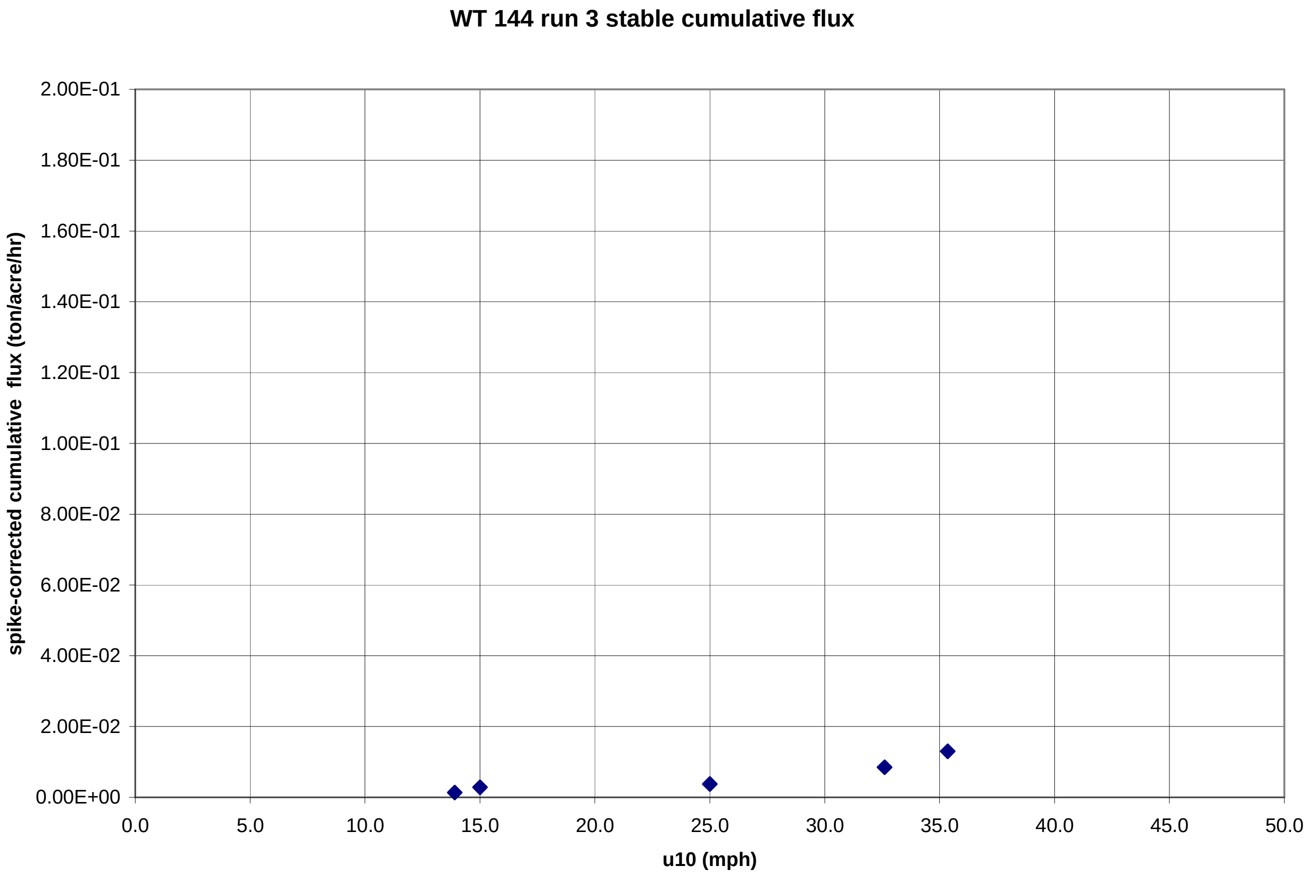
Appendix C (continued)

Figure 193 – U10 versus spike corrected flux – WT 144 2U



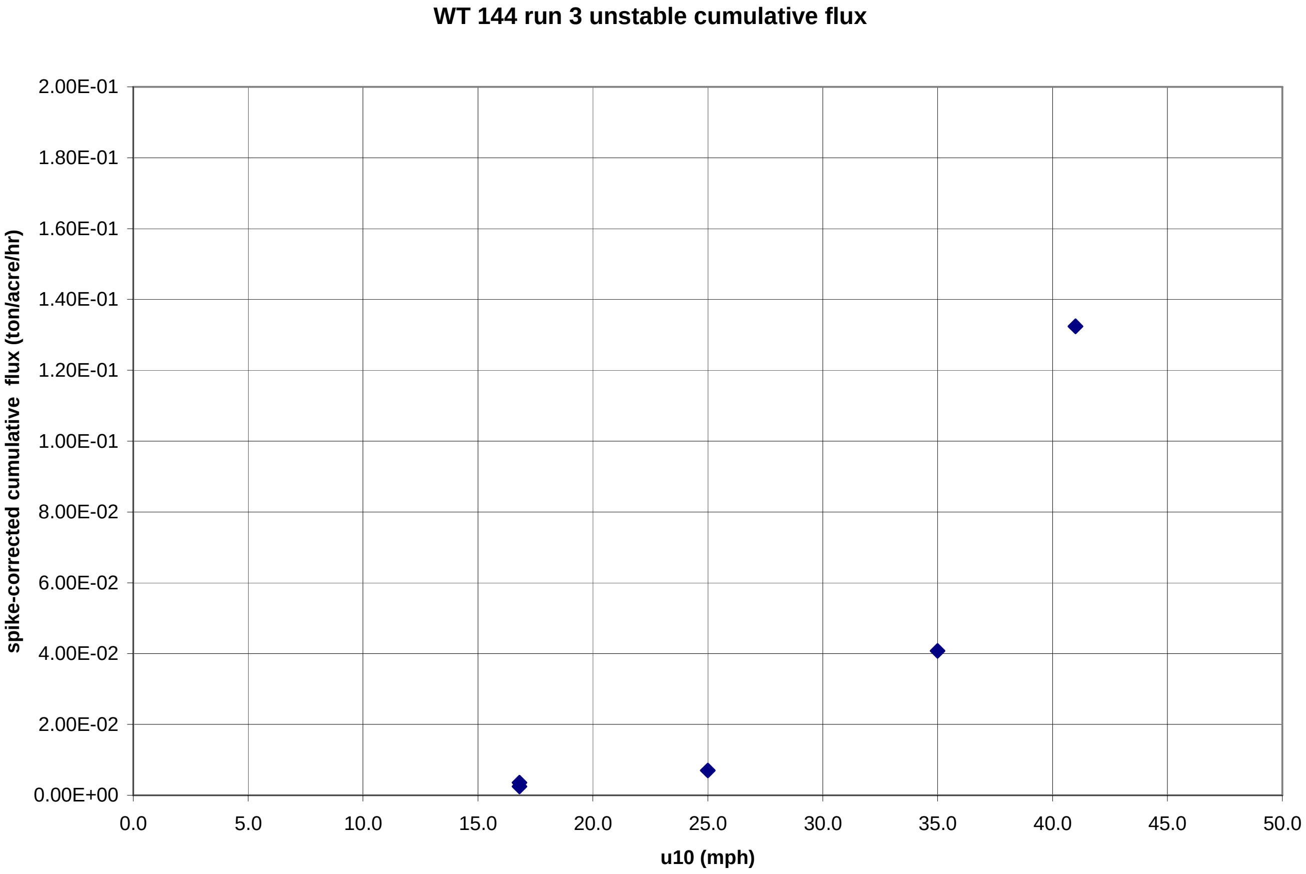
Appendix C (continued)

Figure 194 – U10 versus spike corrected flux – WT 144 3S



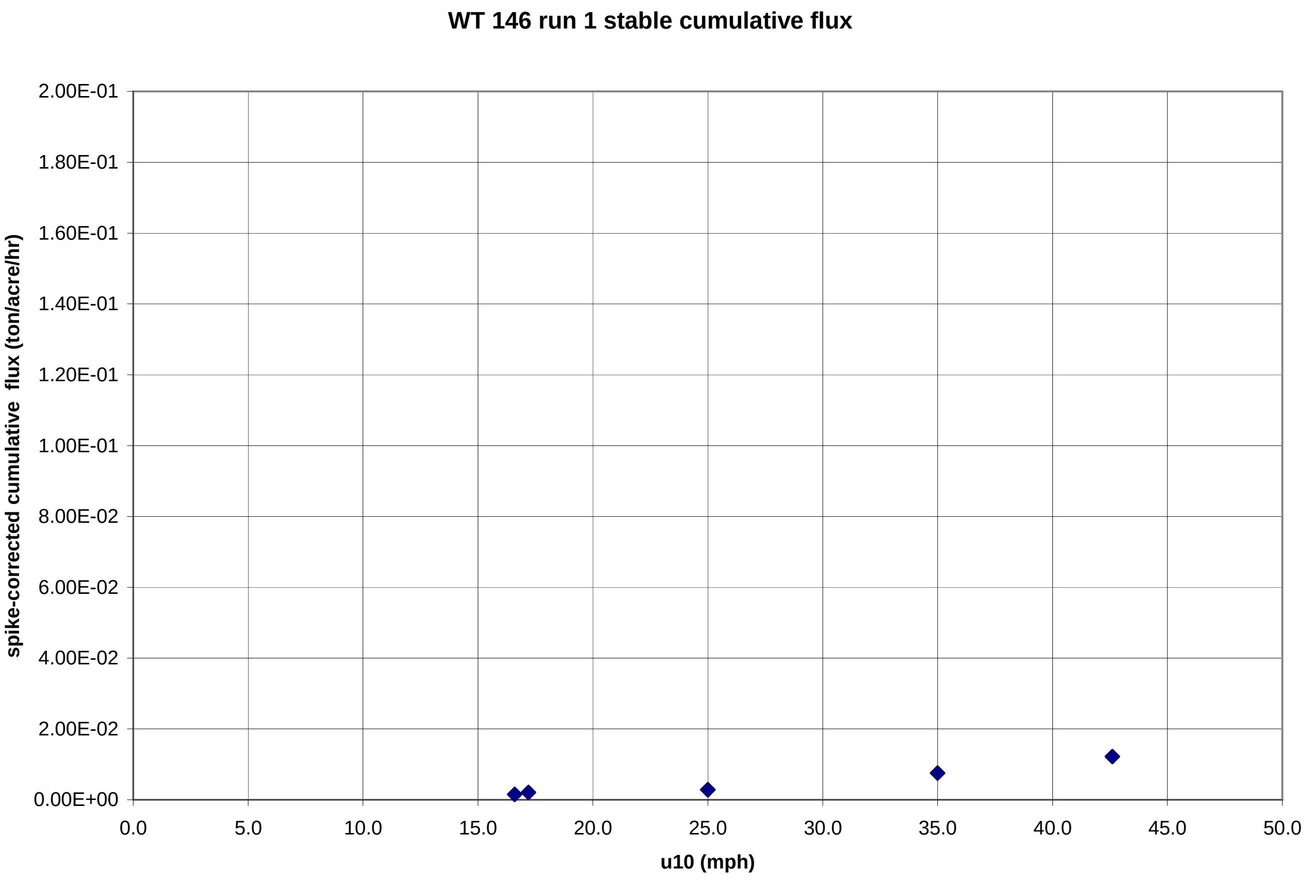
Appendix C (continued)

Figure 195 – U10 versus spike corrected flux – WT 144 3U



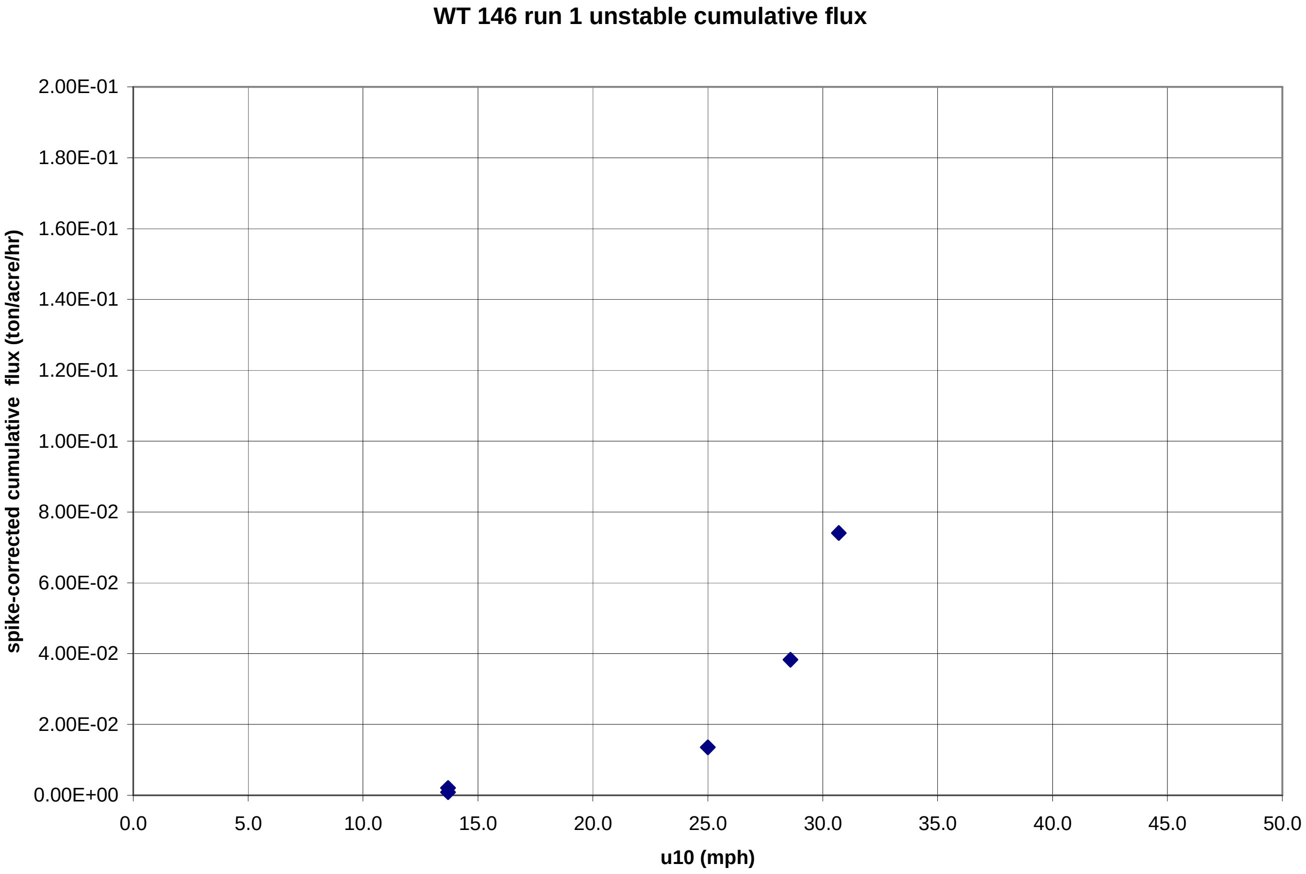
Appendix C (continued)

Figure 196 – U10 versus spike corrected flux – WT 146 1S



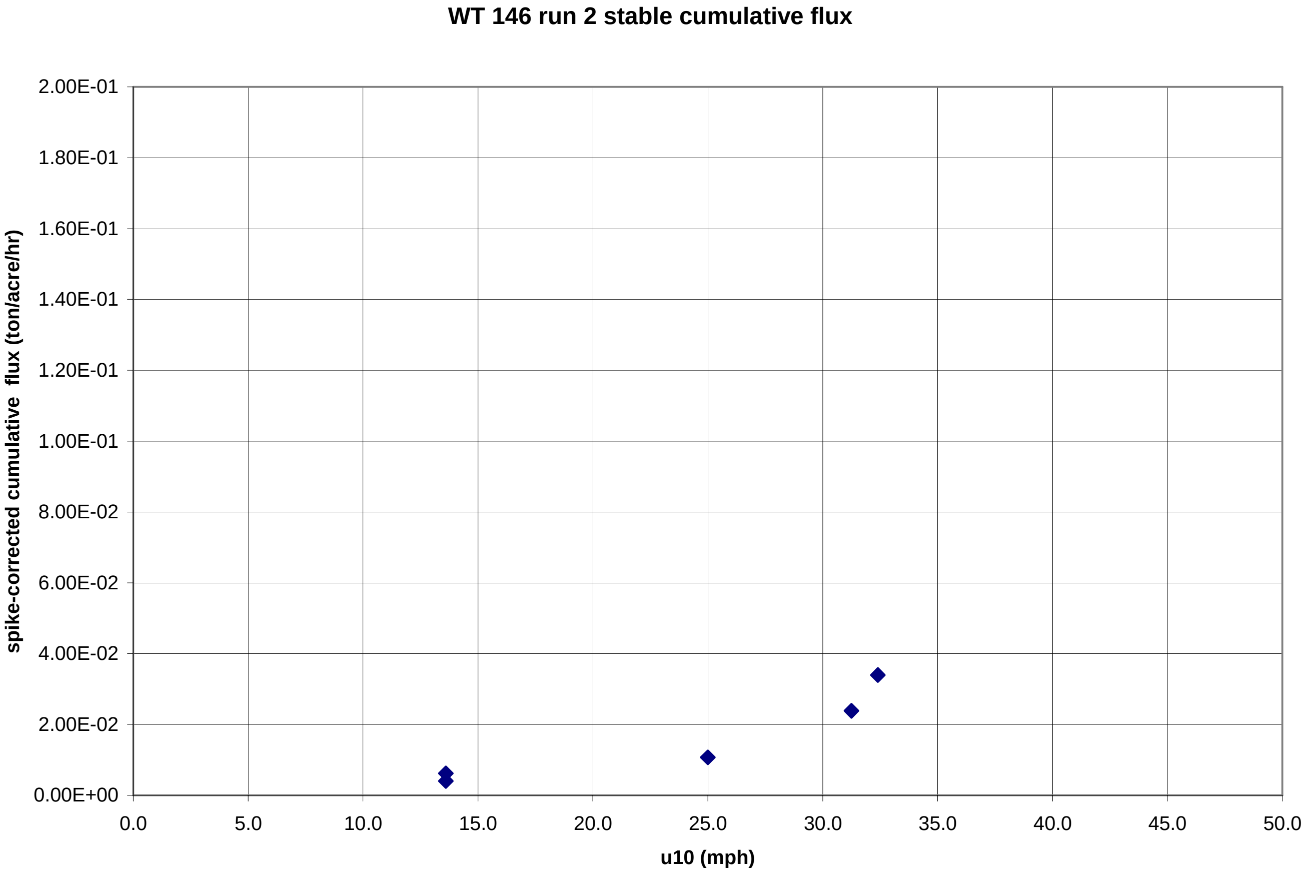
Appendix C (continued)

Figure 197 – U10 versus spike corrected flux – WT 146 1U



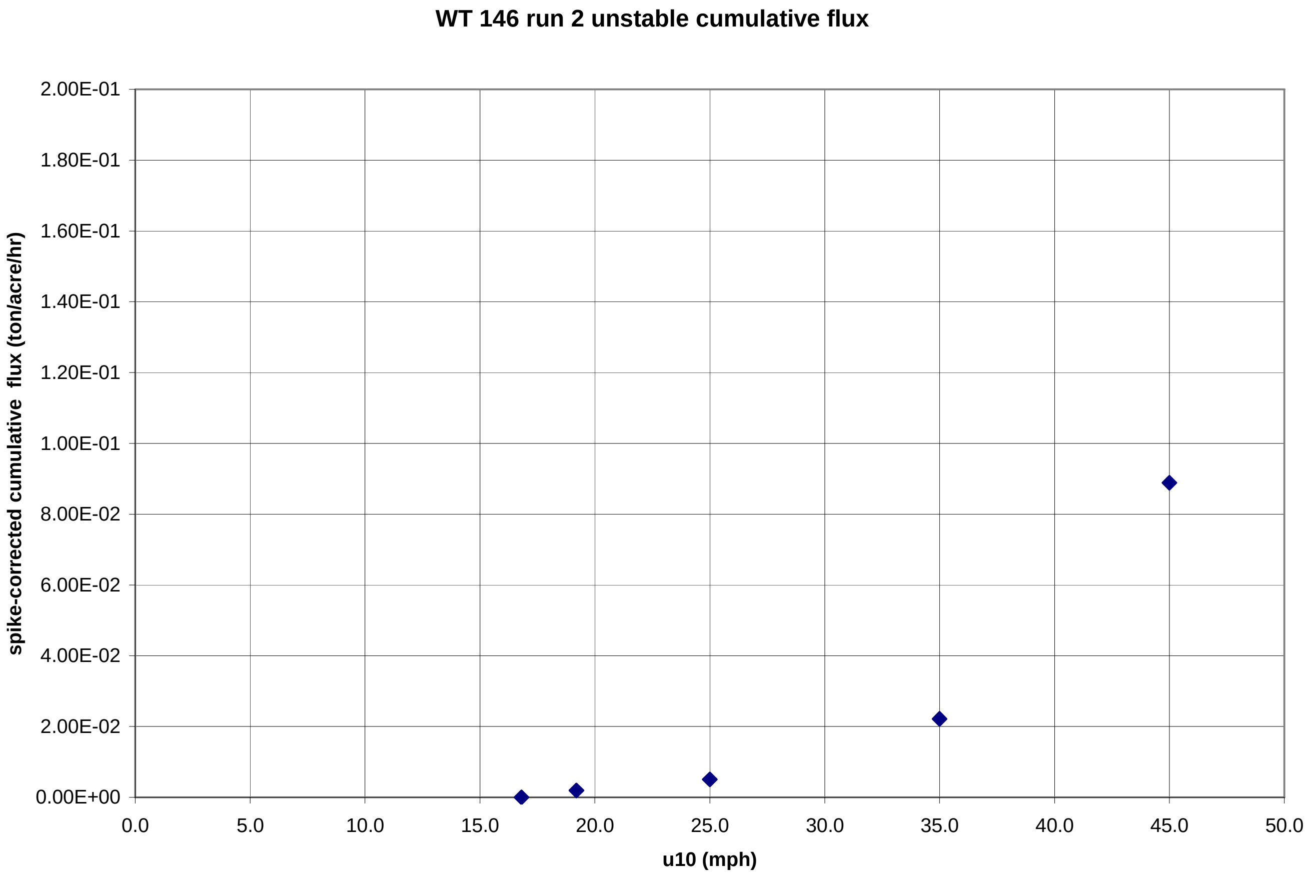
Appendix C (continued)

Figure 198 – U10 versus spike corrected flux – WT 146 2S



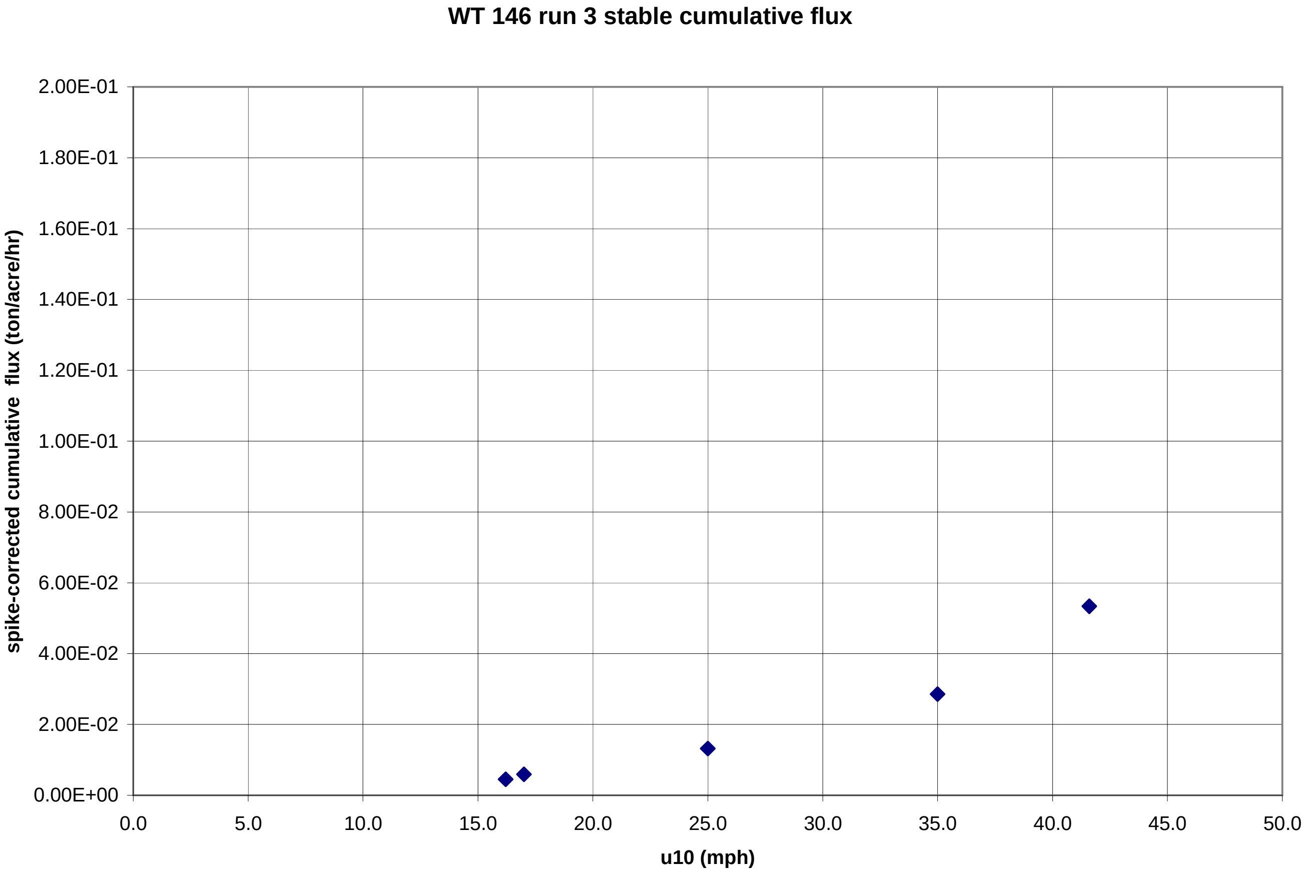
Appendix C (continued)

Figure 199 – U10 versus spike corrected flux – WT 146 2U



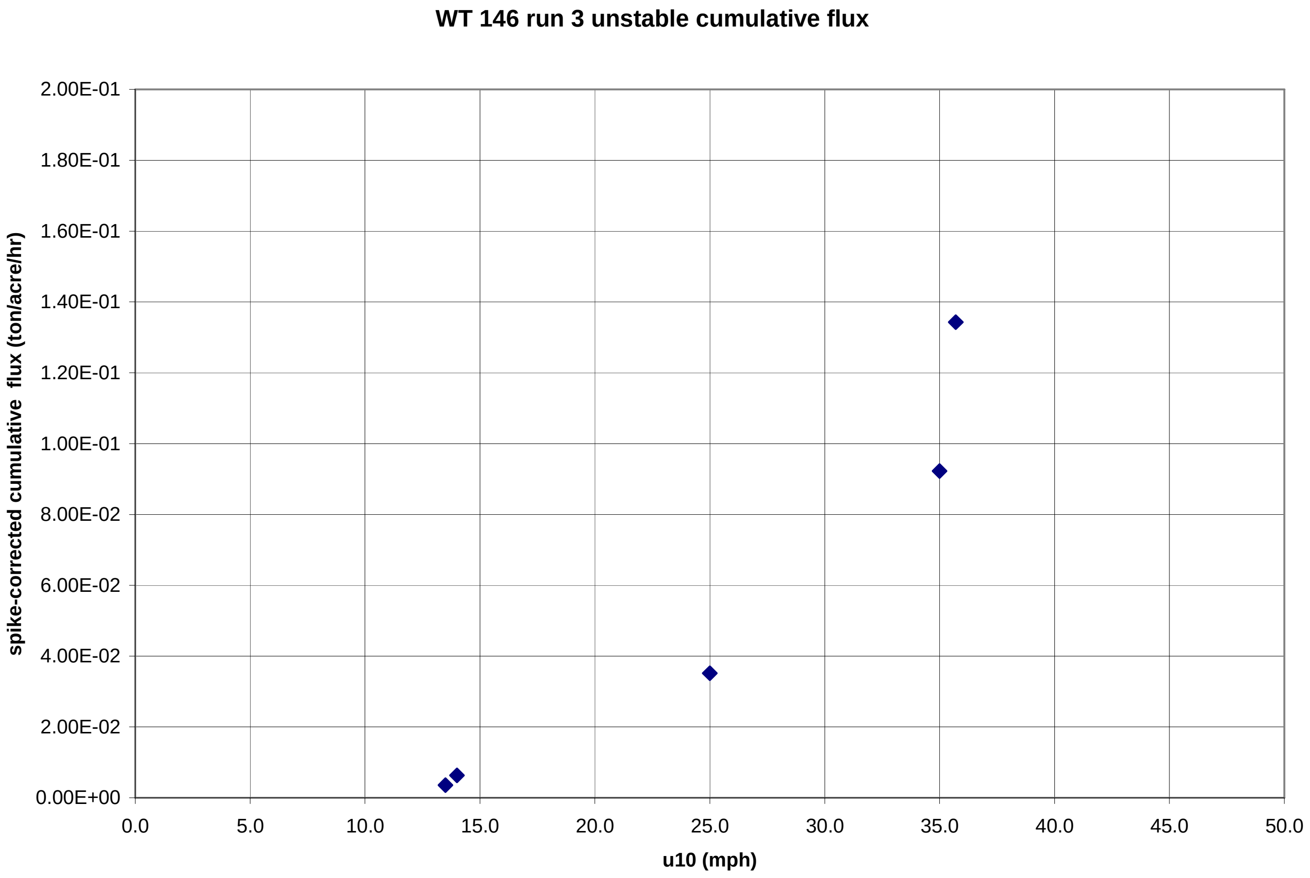
Appendix C (continued)

Figure 200 – U10 versus spike corrected flux – WT 146 3S



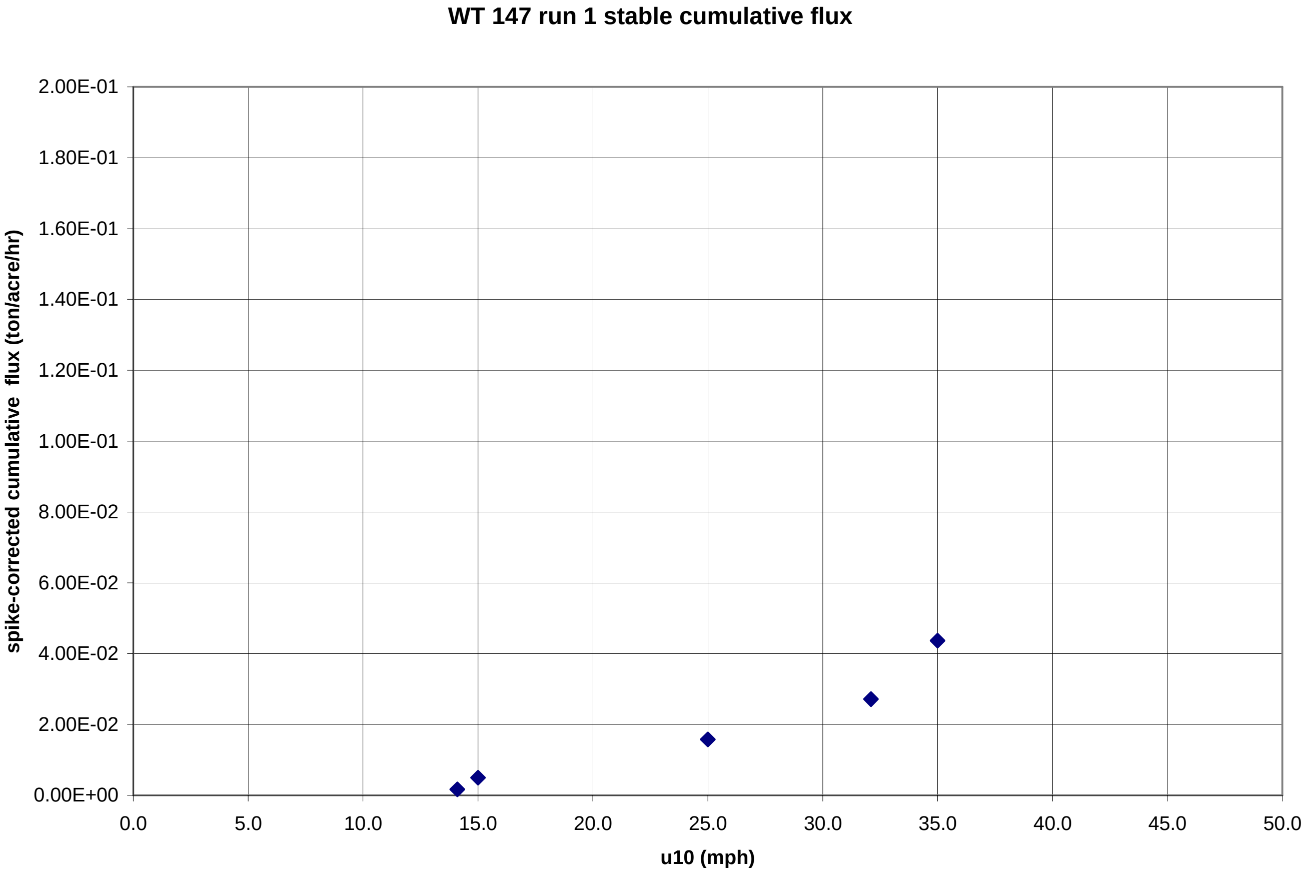
Appendix C (continued)

Figure 201 – U10 versus spike corrected flux – WT 146 3U



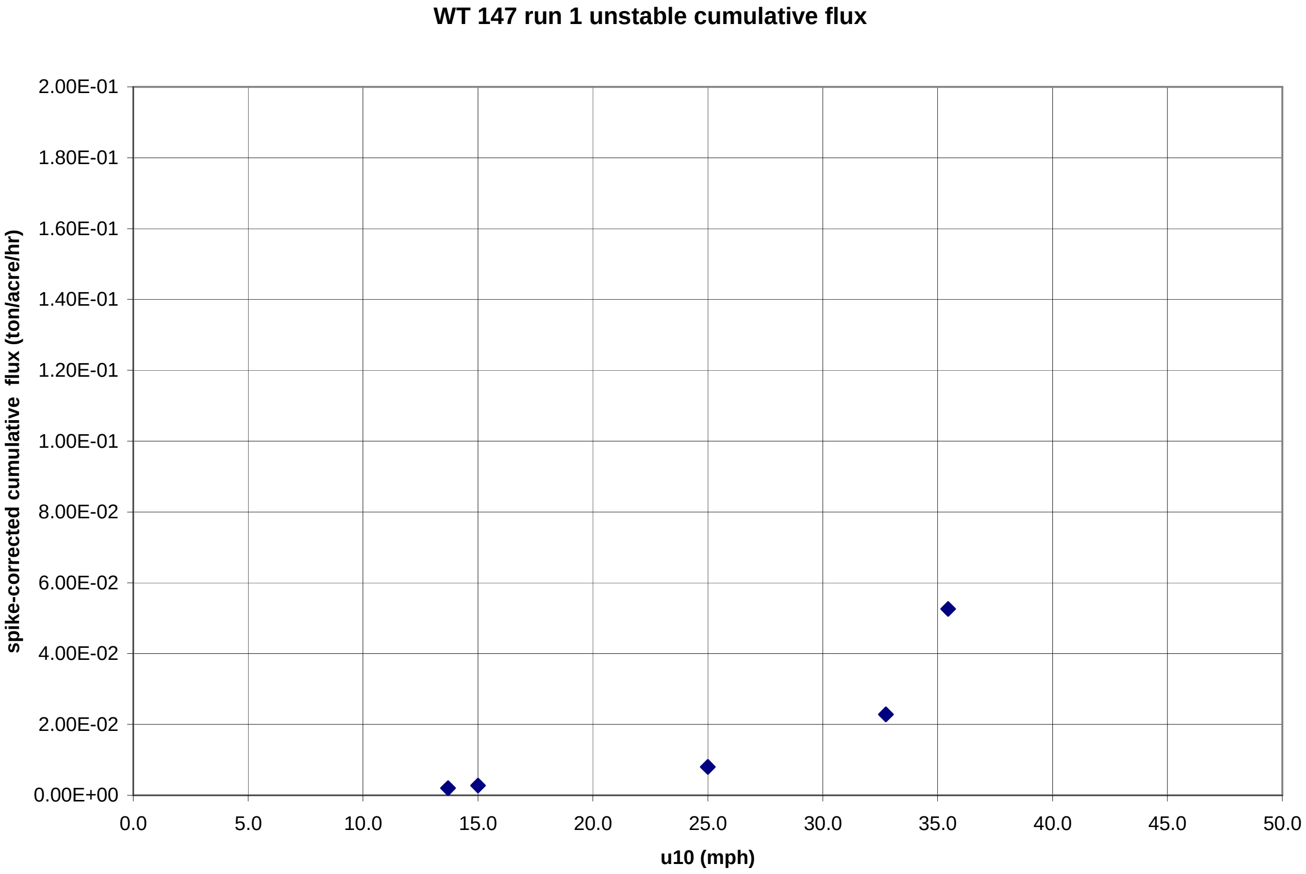
Appendix C (continued)

Figure 202 – U10 versus spike corrected flux – WT 147 1S



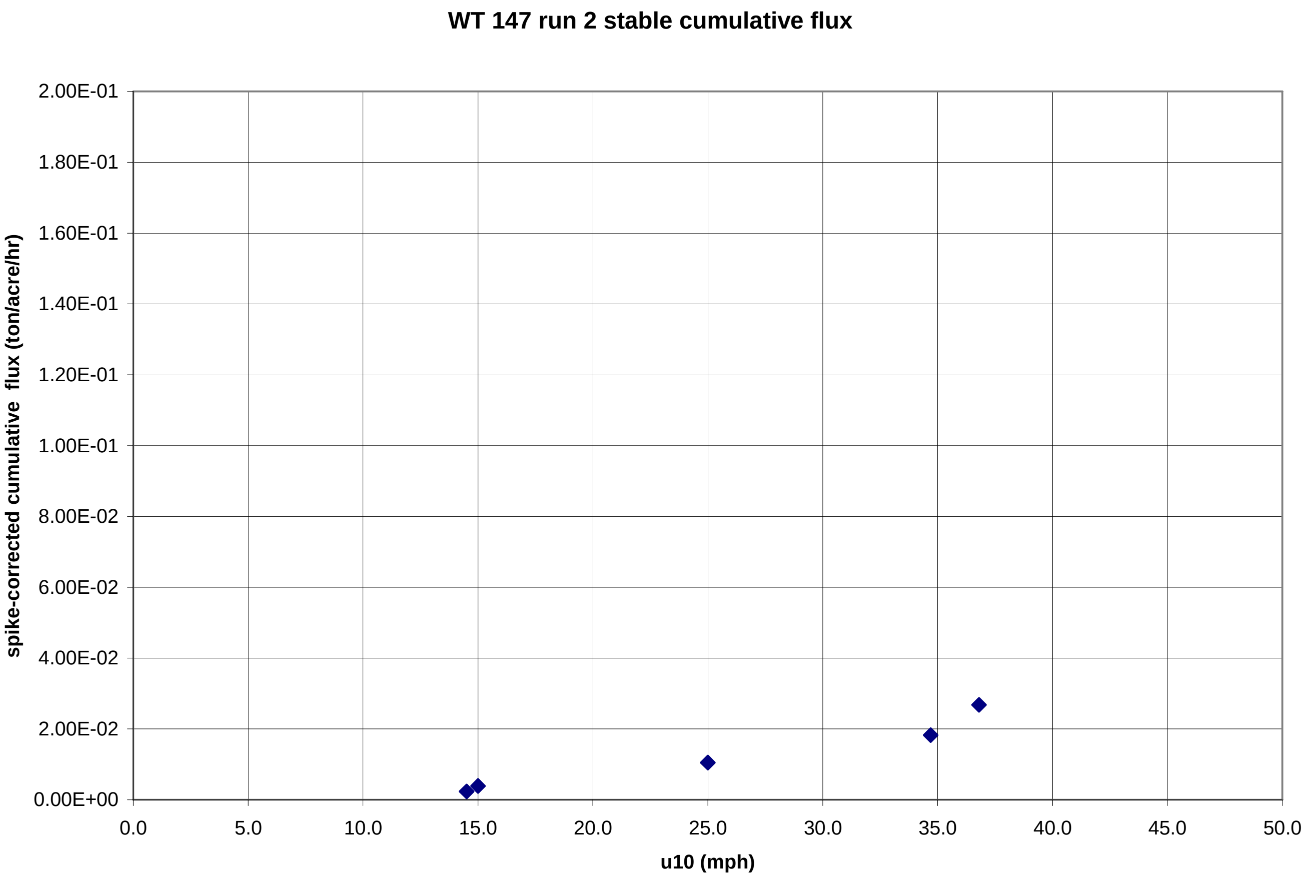
Appendix C (continued)

Figure 203 – U10 versus spike corrected flux – WT 147 1U



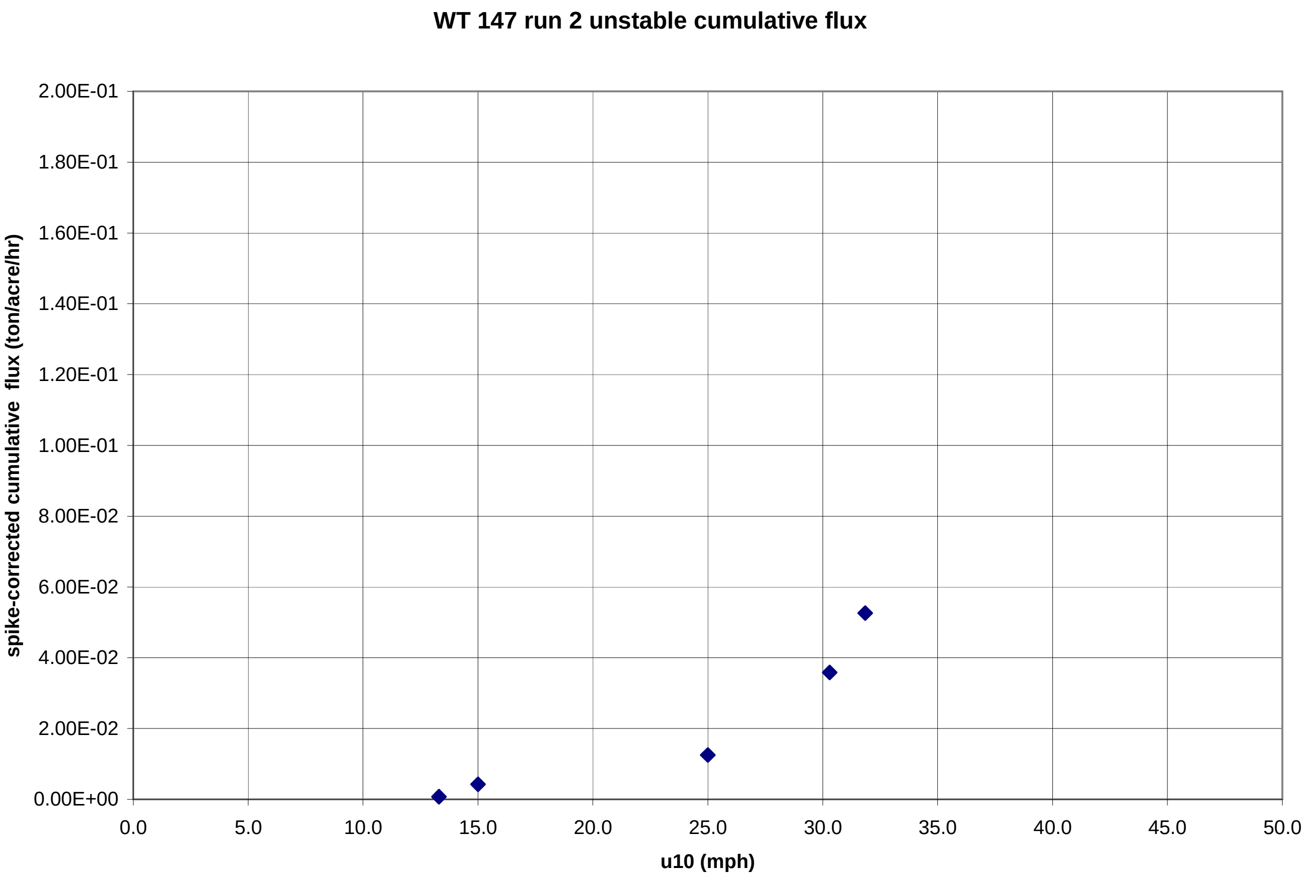
Appendix C (continued)

Figure 204 – U10 versus spike corrected flux – WT 147 2S



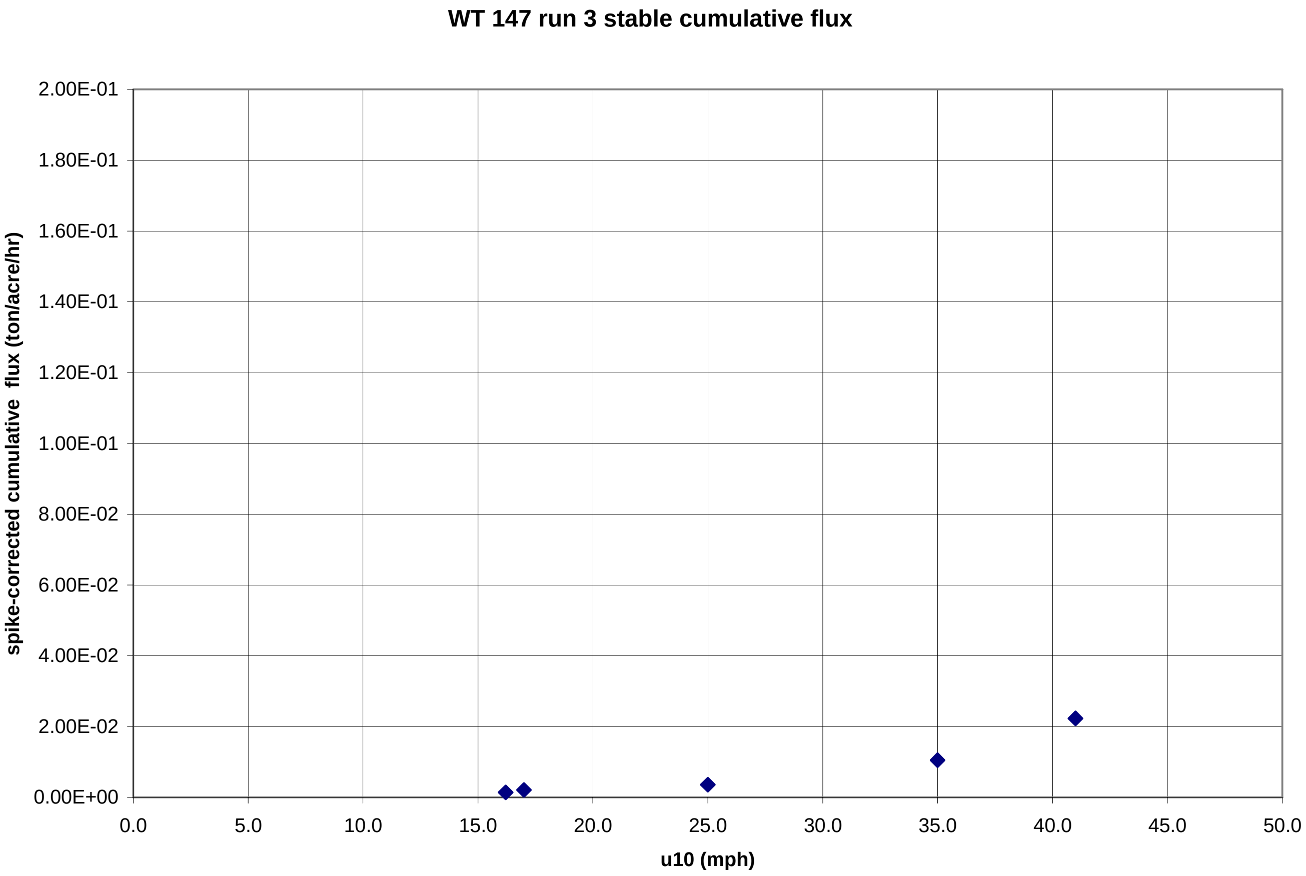
Appendix C (continued)

Figure 205 – U10 versus spike corrected flux – WT 147 2U



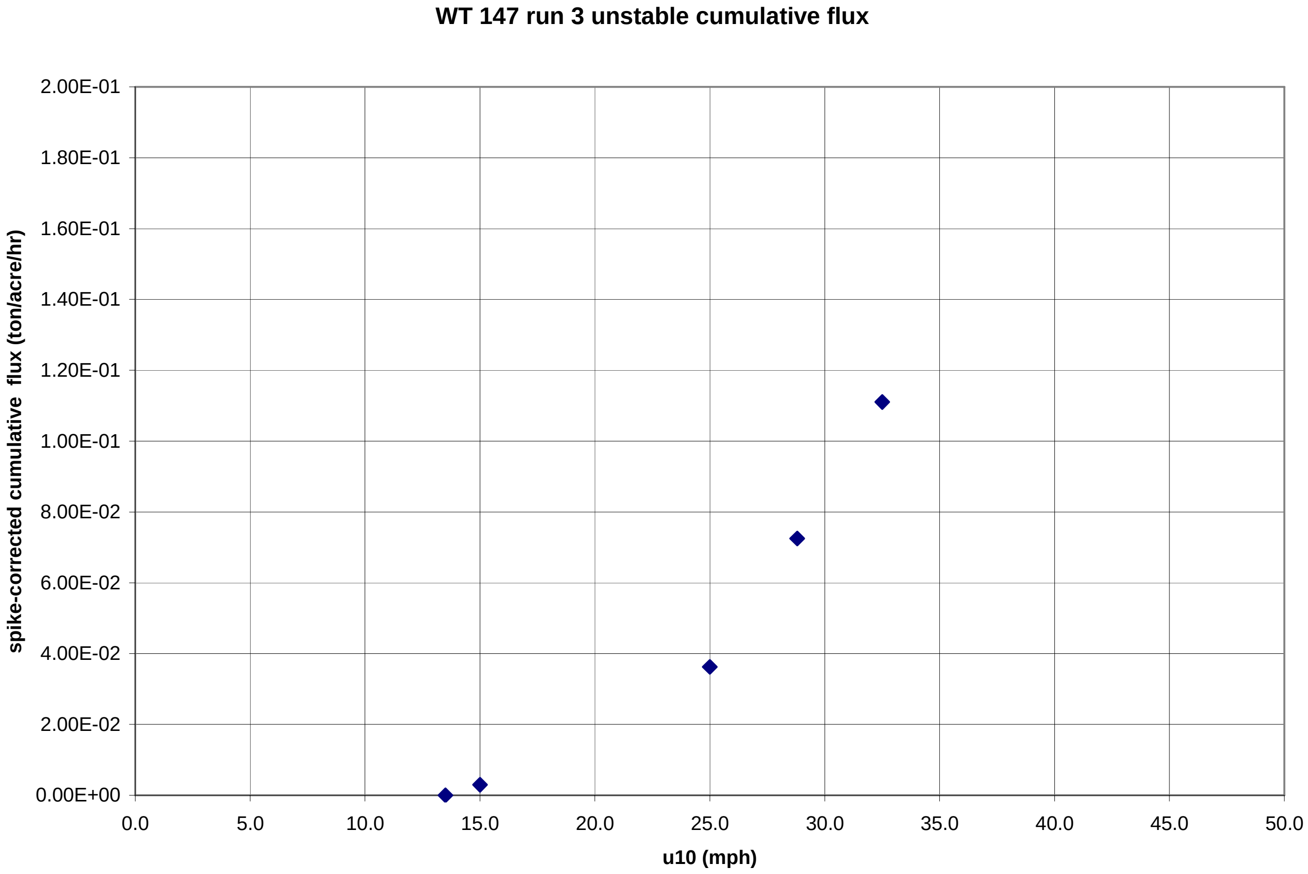
Appendix C (continued)

Figure 206 – U10 versus spike corrected flux – WT 147 3S



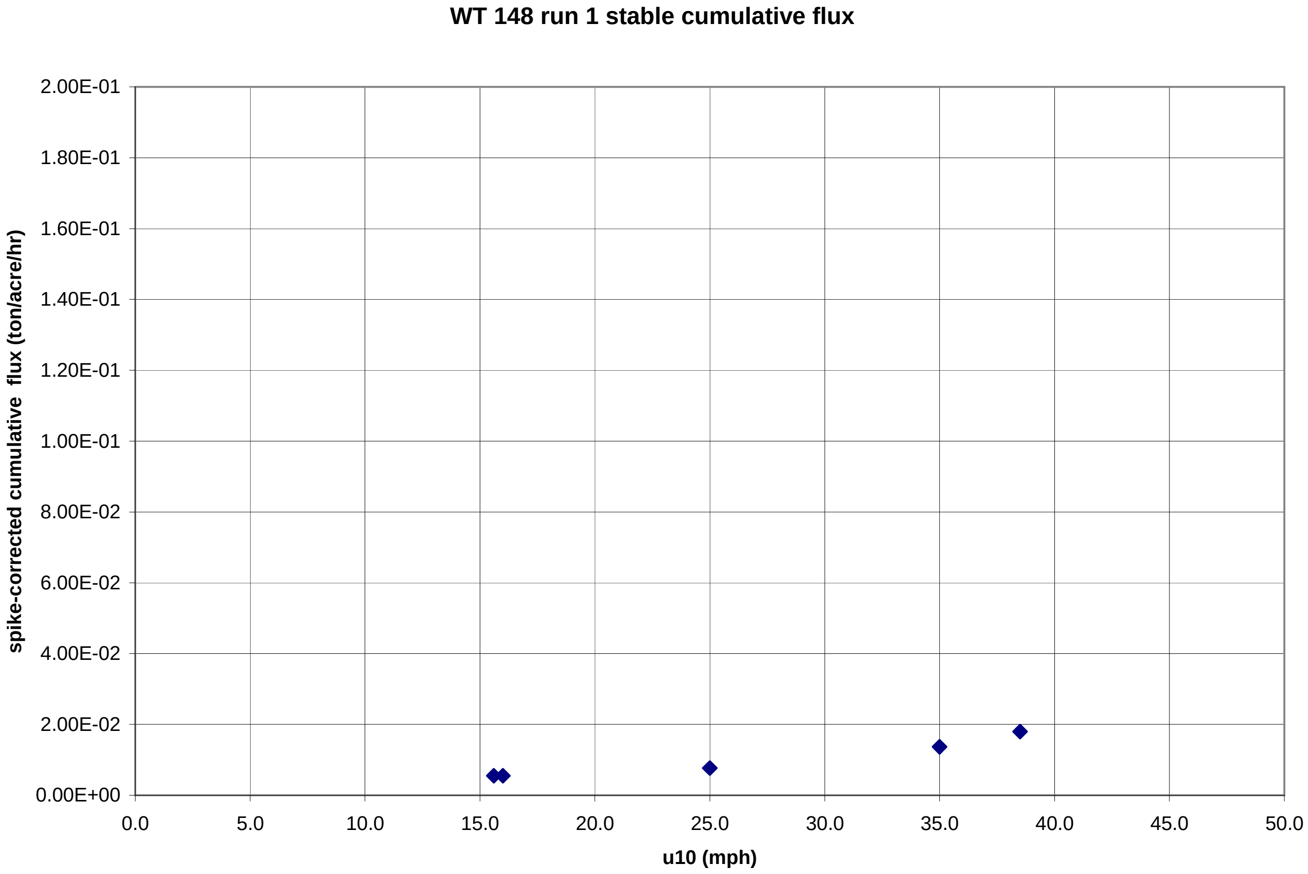
Appendix C (continued)

Figure 207 – U10 versus spike corrected flux – WT 147 3U



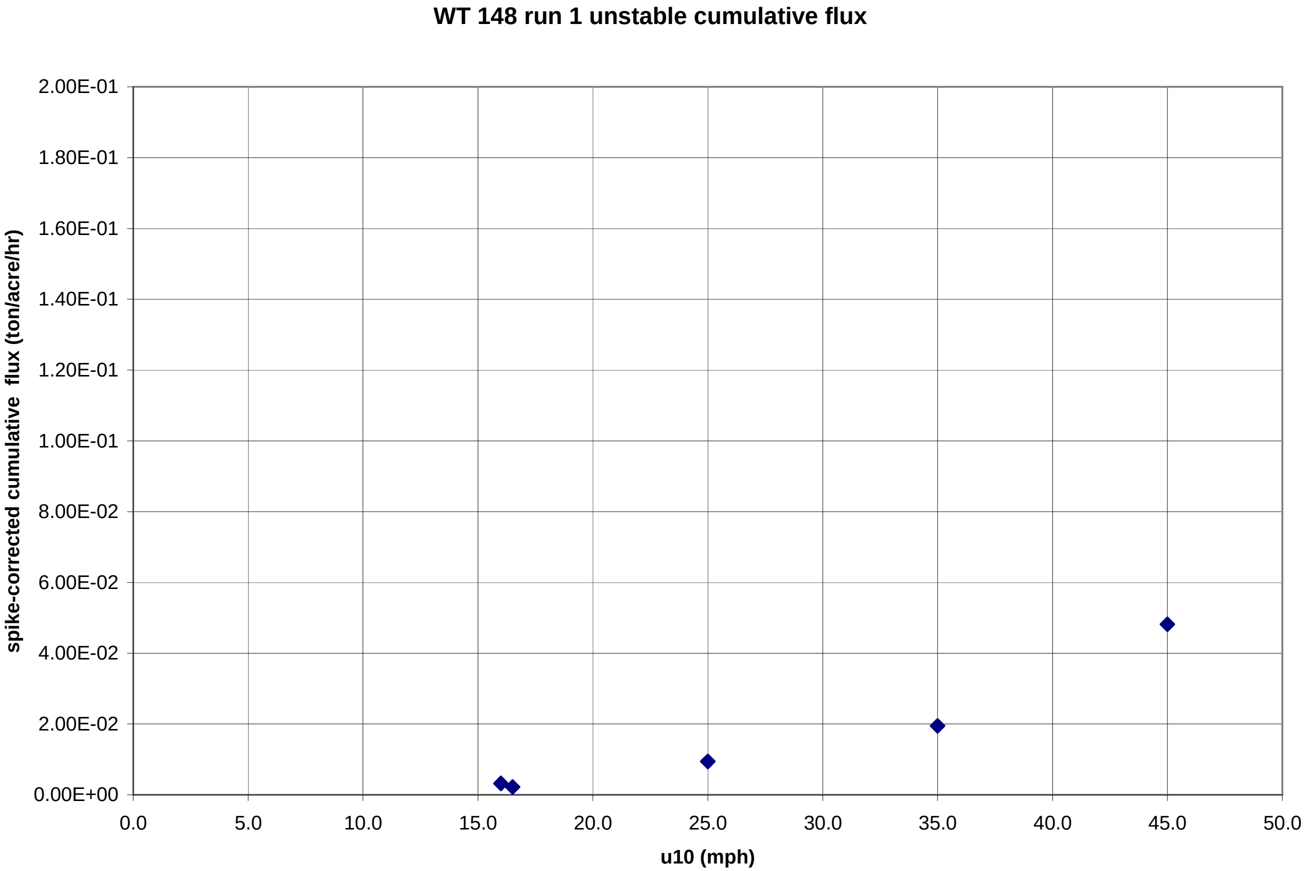
Appendix C (continued)

Figure 208 – U10 versus spike corrected flux – WT 148 1S



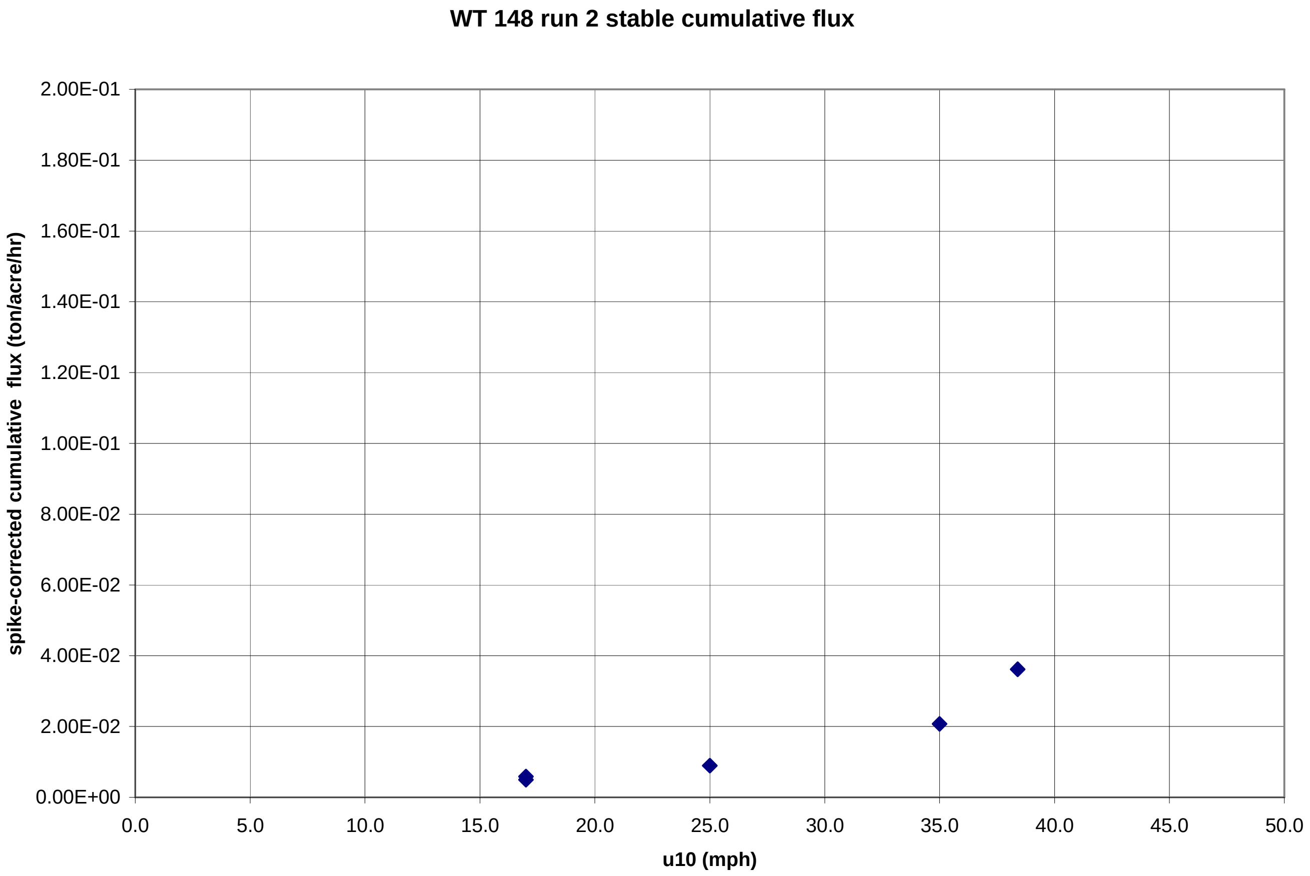
Appendix C (continued)

Figure 209 – U10 versus spike corrected flux – WT 148 1U



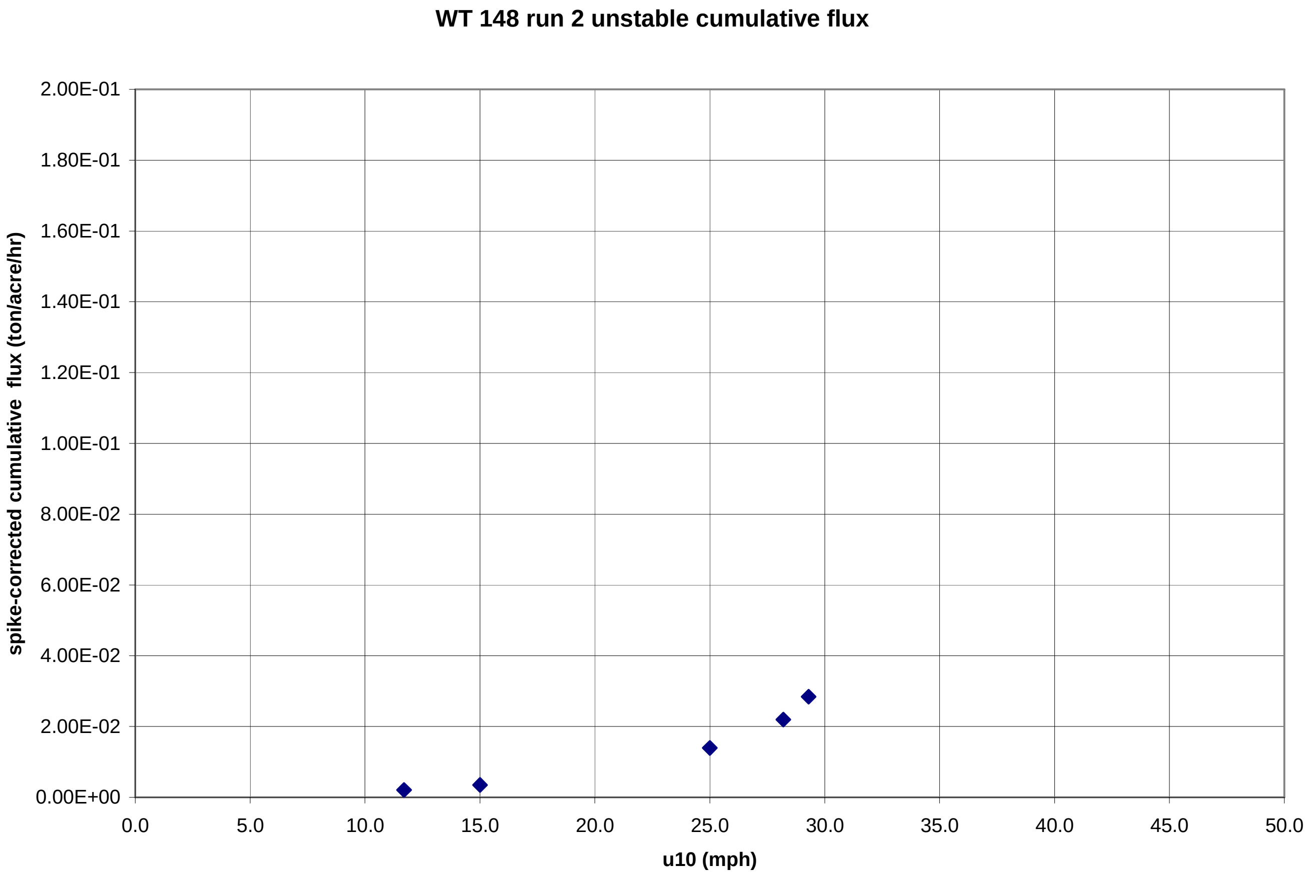
Appendix C (continued)

Figure 210 – U10 versus spike corrected flux – WT 148 2S



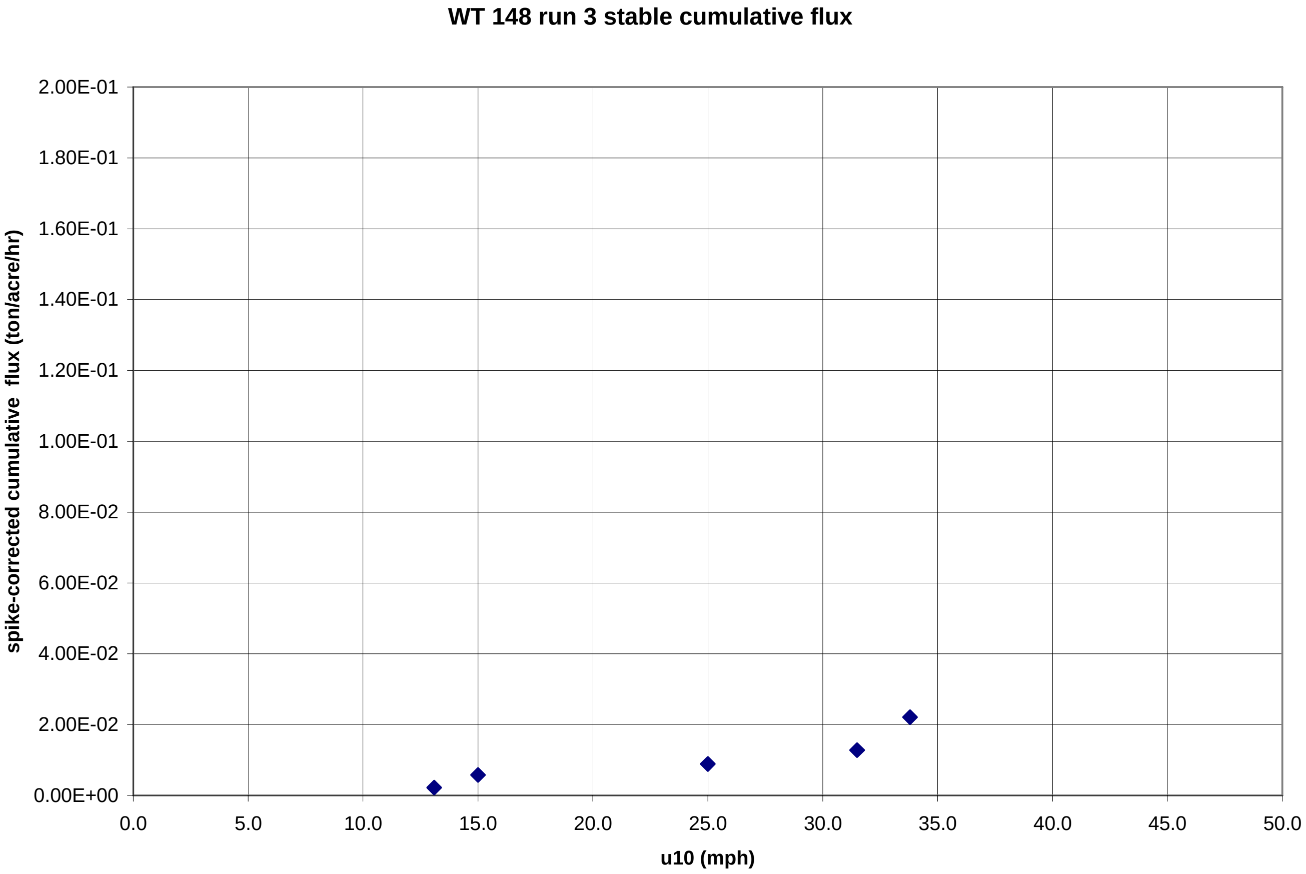
Appendix C (continued)

Figure 211 – U10 versus spike corrected flux – WT 148 2U



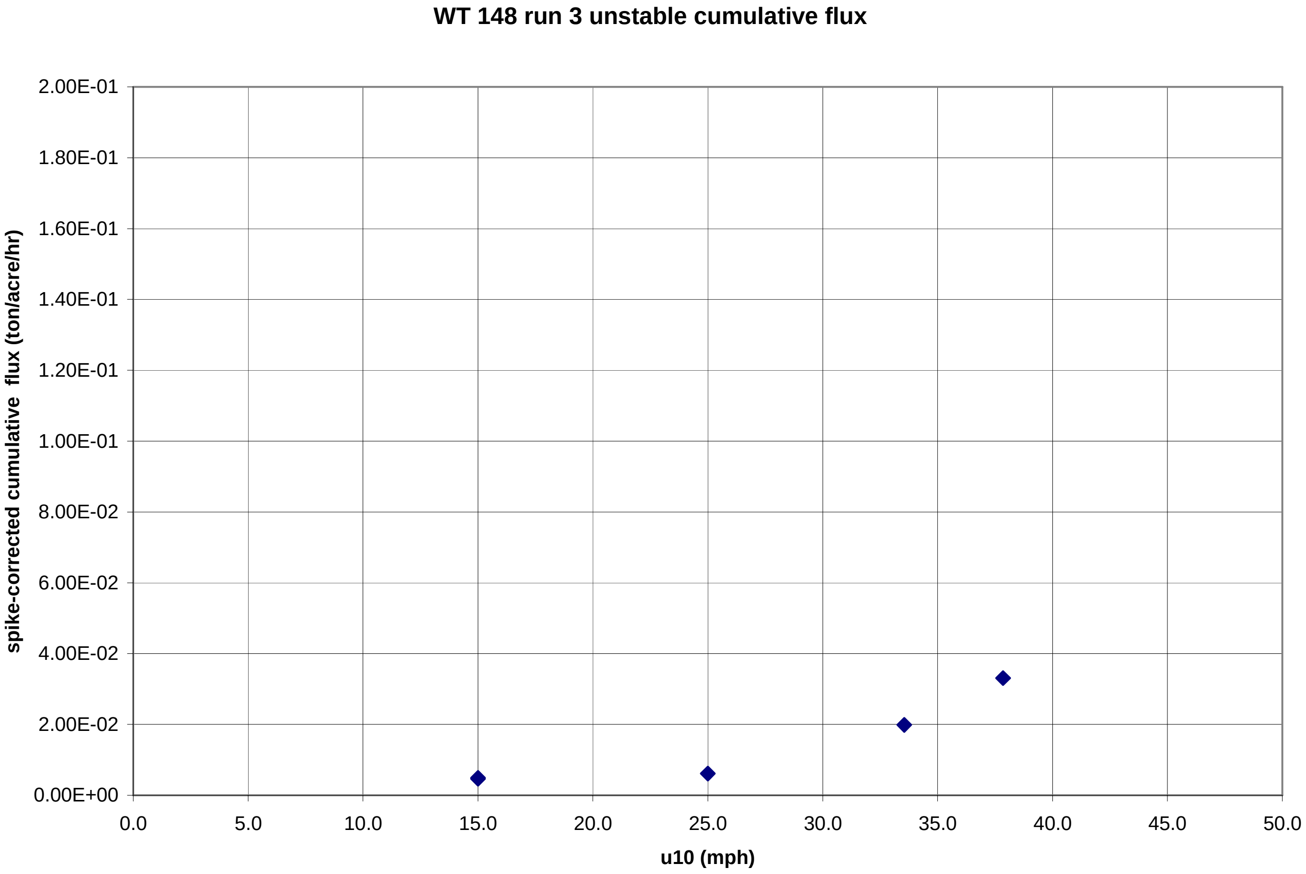
Appendix C (continued)

Figure 212 – U10 versus spike corrected flux – WT 148 3S



Appendix C (continued)

Figure 213 – U10 versus spike corrected flux – WT 148 3U



Appendix E

Clark County, Nevada

Section 2: Addendum to 2004 Wind Tunnel Study - PM_{10} Milestone Achievement Report

Final Report

June 30, 2006

Addendum to 2004 Wind Tunnel Field Study

Comparison of Vacant Lands PM_{10} Emission Factors used in 2001 SIP (1995 and 1998-99 wind tunnel field studies) to 2004 Vacant Lands PM_{10} Emission Factors

For Clark County Dept Air Quality and Environmental Management

PM_{10} SIP Milestone Achievement Report

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June 30, 2006

Stable Wind Erosion Rates

Stable Wind Erosion rates, averaged over all soil groups, are compared for 2004 and 1995 in Table 1 below.

Table 1. Comparison of Stable PM-10 wind tunnel erosion rates, averaged over all Wind Erodibility Groups, for 2004 and 1995.

ALL WEG Stable - 2004				
wind band (mph)	**geo mean - 1 std.dev flux, ton/acre/hr**	**geo mean flux ton/acre/hr**	**geo mean + 1 std.dev flux, ton/acre/hr**	**sample size, n=**
10-15	6.09E-04	1.73E-03	4.92E-03	77
15-20	5.37E-04	1.60E-03	4.78E-03	91
20-25	8.88E-04	3.07E-03	1.06E-02	97
25-30	5.35E-03	1.04E-02	2.01E-02	11
30-35	2.64E-03	7.97E-03	2.41E-02	102
35-40	4.16E-03	1.24E-02	3.67E-02	33
40-45	3.95E-03	1.12E-02	3.18E-02	41
45-50	3.91E-03	1.28E-02	4.18E-02	2
50-55				
55-60				
60-65				
total data points				454
average, 15-40 mph		7.07E-03		

ALL WEG Stable - 1995				
wind band (mph)	**geo mean - 1 std.dev flux, ton/acre/hr**	**geo mean flux ton/acre/hr**	**geo mean + 1 std.dev flux, ton/acre/hr**	**sample size, n=**
10-15				
15-20	N/A	1.95E-03	N/A	1
20-25	3.16E-04	1.38E-03	6.07E-03	4
25-30	9.46E-04	2.57E-03	7.00E-03	11
30-35	7.81E-04	3.16E-03	1.28E-02	23
35-40	9.17E-04	2.99E-03	9.73E-03	28
40-45	2.08E-03	5.92E-03	1.68E-02	34
45-50	3.02E-03	7.58E-03	1.90E-02	30
50-55	5.94E-03	1.10E-02	2.02E-02	22
55-60	9.03E-03	1.69E-02	3.15E-02	12
60-65	9.99E-03	1.66E-02	2.76E-02	4
total data points				169
average, 15-40 mph		2.41E-03		

Figures 1 and 2 graphically depict the data shown in Table 1. For Stable 2004 flux rates (Figure 1), the emission rates tend to reach a plateau at about 0.0100 ton/acre/hour at the wind speeds greater than 27.5 miles per hour (25-30mph wind band). In contrast, 1995 erosion rates are lower than the 2004 rates, and rise until hitting a 0.0100 ton/acre/hour plateau at 52.5 mph (50-55 mph wind band).

From Table 1, it can be observed that the 2004 estimates were usually computed from much larger data sets than the 1995 data. This is a result of the different field measurement strategy employed in 2004, where fluxes were intentionally measured at lower, pre-set velocity points. The field protocol for the 2004 study was intentionally developed to create larger data sets for the flux measurements, to lower the uncertainty of the estimates of stable wind erosion rates in each wind speed band.

Figure 1. 2004 Stable wind tunnel erosion rates. Data from Table 1.

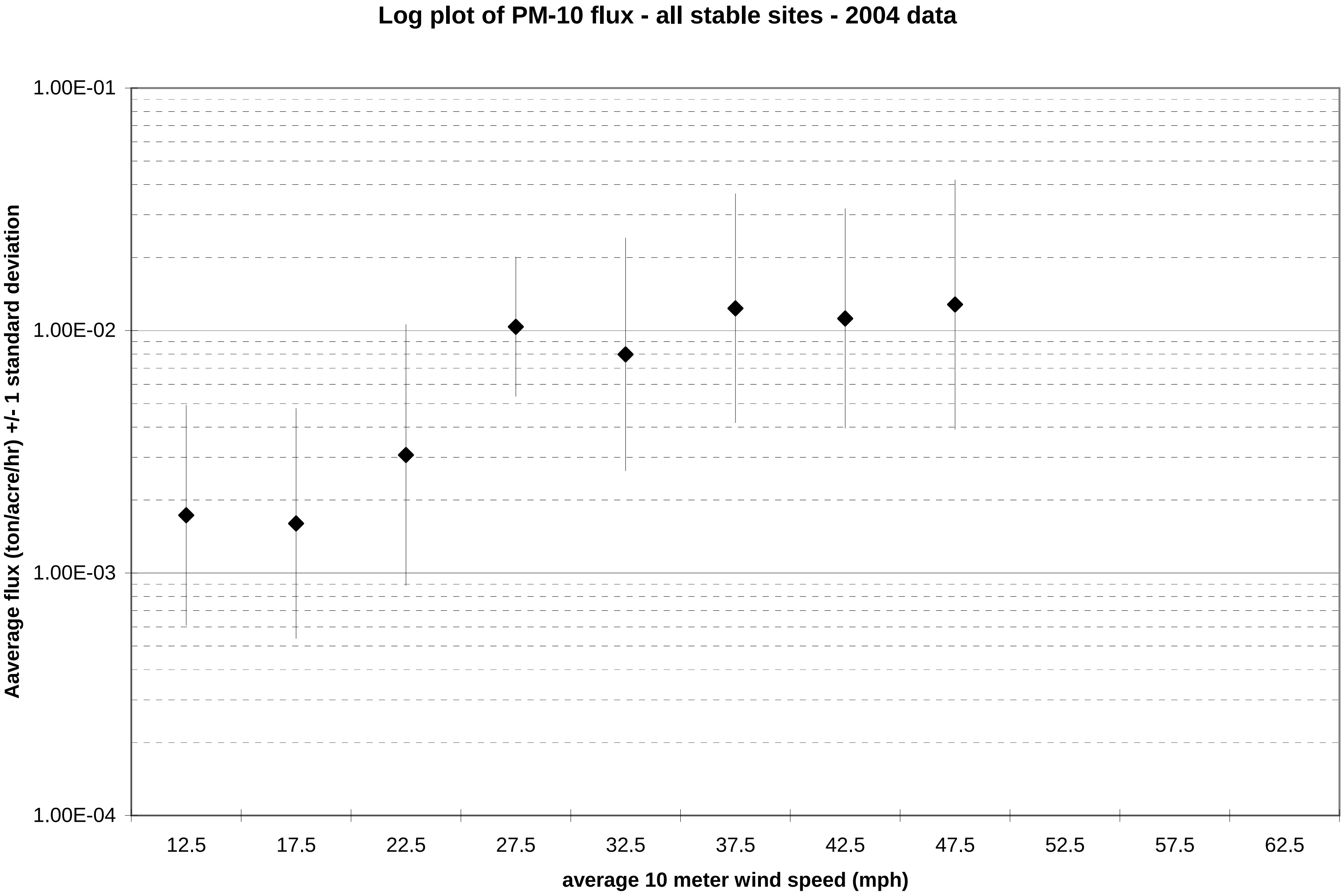
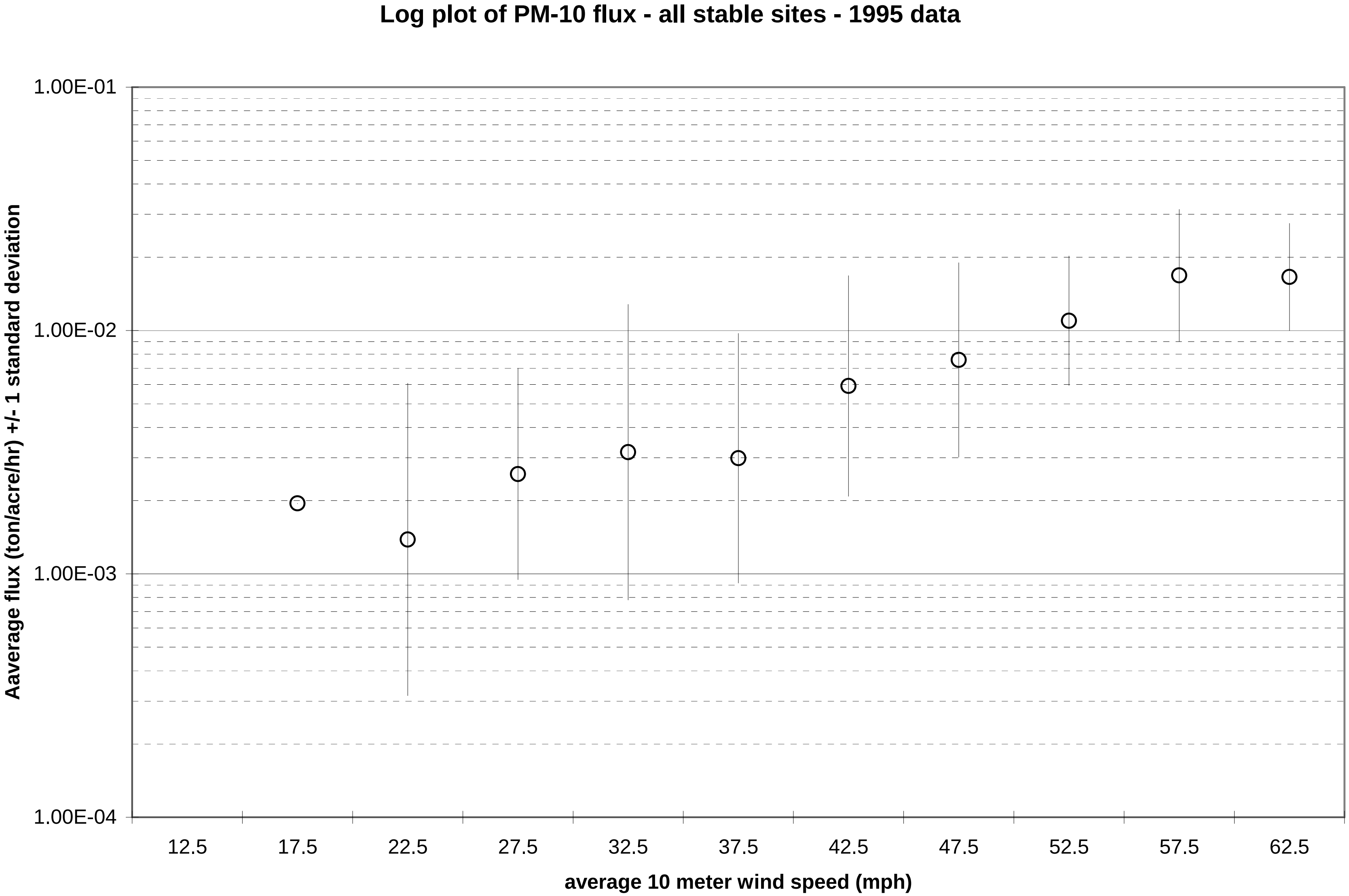


Figure 2. 1995 Stable wind tunnel erosion rates. Data from Table 1



Computed Ratios of 2004 to 1995 stable erosion rates are shown in Table 2.

Table 2: Computed ratios of 2004 to 1995 Stable wind tunnel erosion rates, using data shown in Table 1.

ALL WEG Stable - ratio of 2004 to 1995 data			
wind band (mph)	**geo mean - 1 std.dev**	**geo mean**	**geo mean + 1 std.dev**
10-15			
15-20		0.82	
20-25	2.81	2.21	1.74
25-30	5.65	4.03	2.87
30-35	3.38	2.52	1.88
35-40	4.54	4.14	3.77
40-45	1.89	1.89	1.89
45-50	1.30	1.69	2.20
50-55			
55-60			
60-65			
average ratio	3.26	2.47	2.39

Geometric mean 2004 stable erosion rates were, on average, a factor of 2.5 higher than 1995 stable erosion rates, with multipliers ranging from 0.82 to 4.14 .

The higher values likely occurred because of differences in sampling methods. In the 2004 study, the wind tunnel was moved three times at each study site, and obtained erosion data at each wind speed from a soil surface that likely had been depleted less than during the 1995 study, where the tunnel was run in place for 10 minutes at each increasing wind speed.

The 2004 field study employed shorter periods (4.0 minute) of steady-state erosion at each velocity compared to the 1995 study (10 minutes), so that the average erosion rate was calculated on a surface that had not been depleted of erodible particles for as long a period as during the 1995 study.

Unstable Erosion Rates

Unstable Wind Erosion rates, averaged over all soil groups, are compared for 2004 and 1995 in Table 3 below.

Table 3. Comparison of Unstable PM-10 wind tunnel erosion rates, averaged over all Wind Erodibilty Groups, for 2004 and 1995.

ALL WEG Unstable - 2004				
wind band (mph)	**geo mean - 1 std.dev flux, ton/acre/hr**	**geo mean flux ton/acre/hr**	**geo mean + 1 std.dev flux, ton/acre/hr**	**sample size, n=**
10-15	6.29E-04	1.80E-03	5.13E-03	63
15-20	4.66E-04	1.29E-03	3.56E-03	102
20-25	1.71E-03	4.66E-03	1.27E-02	103
25-30	6.83E-03	2.20E-02	7.07E-02	12
30-35	6.79E-03	1.72E-02	4.35E-02	96
35-40	1.19E-02	2.81E-02	6.68E-02	30
40-45	1.29E-02	3.13E-02	7.57E-02	46
45-50	1.10E-02	3.17E-02	9.11E-02	5
50-55				
total data points				457
average 15-40 mph		1.47E-02		

ALL WEG Unstable -1995				
wind band (mph)	**geo mean - 1 std.dev flux, ton/acre/hr**	**geo mean flux ton/acre/hr**	**geo mean + 1 std.dev flux, ton/acre/hr**	**sample size, n=**
10-15				
15-20	1.50E-03	4.95E-03	1.63E-02	3
20-25	1.23E-03	5.21E-03	2.21E-02	4
25-30	1.18E-03	6.40E-03	3.48E-02	12
30-35	1.21E-03	4.62E-03	1.76E-02	13
35-40	8.96E-04	7.05E-03	5.54E-02	19
40-45	2.37E-03	1.13E-02	5.41E-02	9
45-50	9.71E-04	7.12E-03	5.22E-02	7
50-55	N/A	3.69E-03	N/A	1
total data points				68
average 15-40		5.64E-03		

Figures 3 and 4 graphically depict the data shown in Table 3. For Unstable 2004 flux rates (Figure 3), the emission rates tend to reach a plateau at about 0.020 to 0.0300 ton/acre/hour at the wind speeds greater than 27.5 miles per hour (25-30mph wind band). In contrast, 1995 erosion rates (Figure 4) are lower than the 2004 rates, and tend to fluctuate between 0.005 and 0.010 ton/acre/hour in wind bands ranging from 15-20 mph to 45-50 mph

From Table 3, it can be observed that the 2004 estimates were usually computed from much larger data sets than the 1995 data. As was the case for the stable emissions factors (Table 1), this is a result of the different field measurement strategy employed in 2004, where fluxes were intentionally measured at lower, pre-set velocity points. The field protocol for the 2004 study was intentionally developed to create larger data sets for the flux measurements, to lower the uncertainty of the estimates of unstable wind erosion rates in each wind speed band.

Unstable PM10 emissions rates are likely higher in 2004 than in 1995 because the 2004 surfaces were freshly destabilized with a rake. In contrast, the 1995 unstable surfaces were tested in the "as-found" condition, and unstable surfaces may have been partially re-stabilized through crusting or fine particle depletion.

Figure 3. 2004 Unstable wind tunnel erosion rates. Data from Table 3.

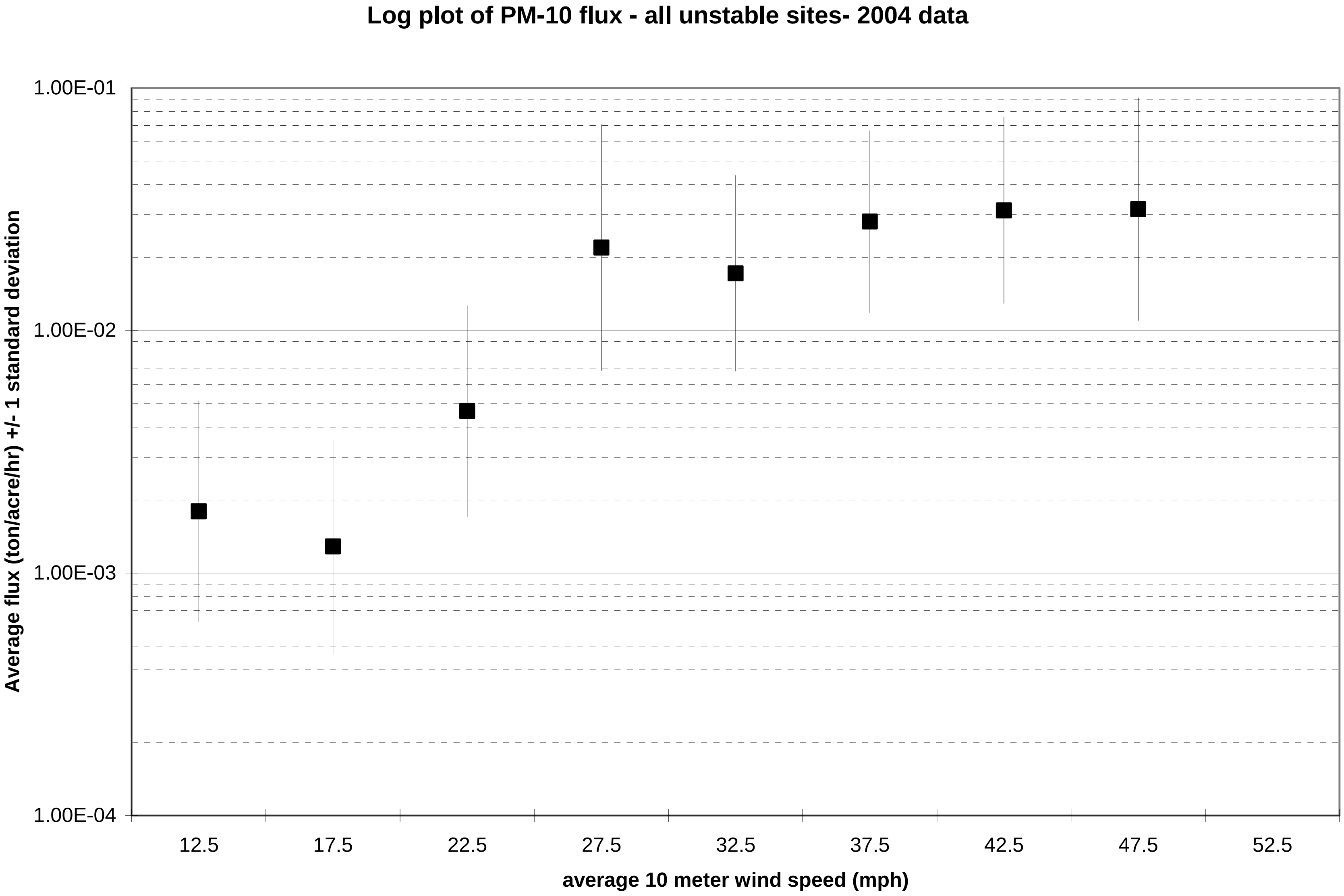
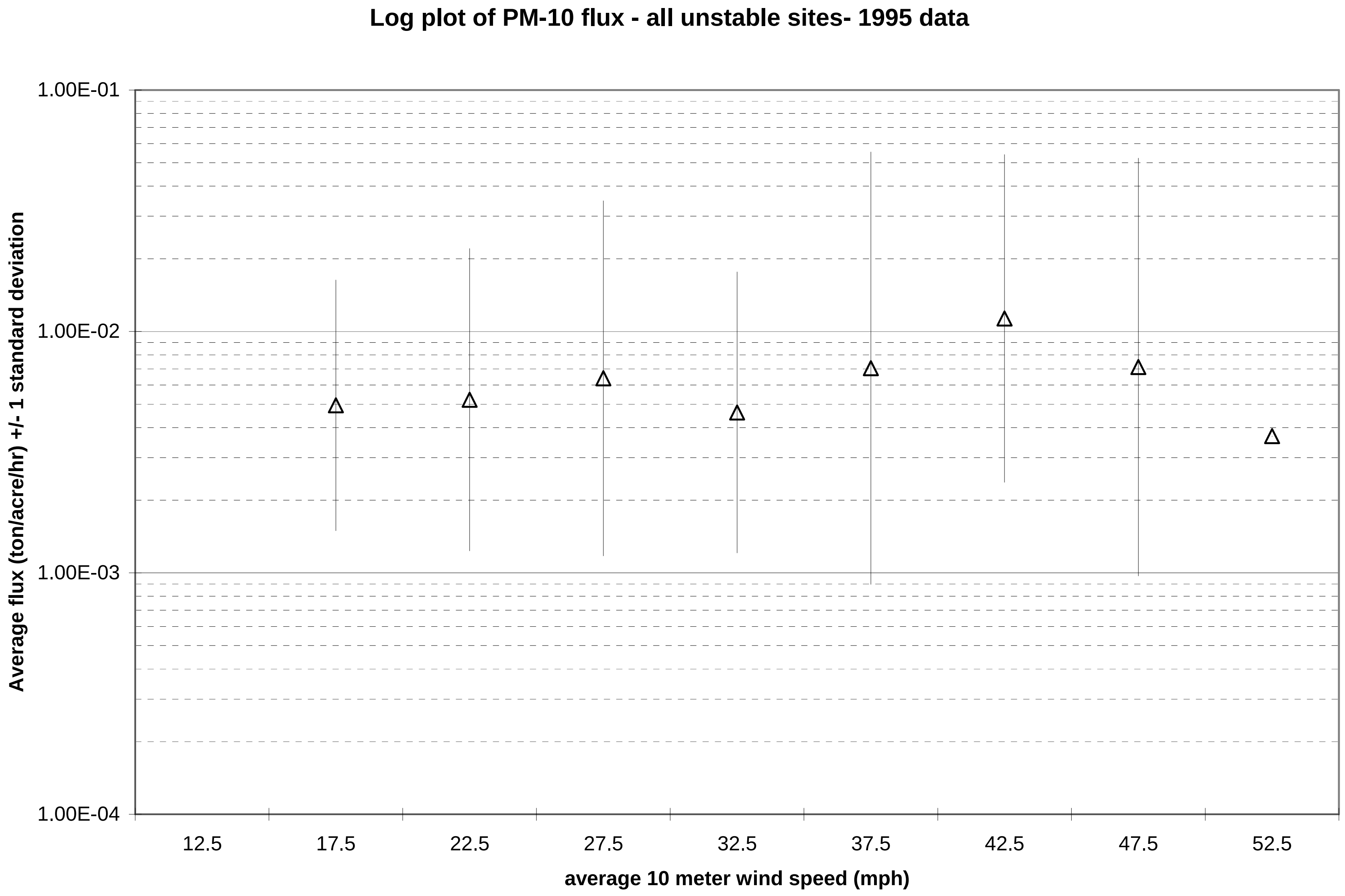


Figure 4. 1995 Unstable wind tunnel erosion rates. Data from Table 3.



Computed Ratios of 2004 erosion rates to 1995 erosion rates are shown in Table 4.

Table 4. Computed Ratios of 2004 to 1995 wind erosion rates, averaged over all Wind Erodibility Groups. Wind bands for which the sample size of either 2004 or 1995 data sets is less than 10 are shown in **bold underlined font** and should be considered unreliable.

ALL WEG Stable - ratio of 2004 to 1995 data

wind band (mph)	geo mean - 1 std.dev	geo mean	geo mean + 1 std.dev
10-15			
15-20		**0.82**	
20-25	**2.81**	**2.21**	**1.74**
25-30	5.65	4.03	2.87
30-35	3.38	2.52	1.88
35-40	4.54	4.14	3.77
40-45	1.89	1.89	1.89
45-50	**1.30**	**1.69**	**2.20**
50-55			
55-60			
60-65			
average ratio	3.26	2.47	2.39
average ratio -reliable data	3.87	3.14	2.60

ALL WEG Unstable - ratio of 2004 to 1995 data

wind band (mph)	geo mean - 1 std.dev	geo mean	geo mean + 1 std.dev
10-15			
15-20	**0.31**	**0.26**	**0.22**
20-25	**1.39**	**0.89**	**0.57**
25-30	5.81	3.44	2.03
30-35	5.62	3.72	2.47
35-40	13.24	4.00	1.21
40-45	**5.45**	**2.76**	**1.40**
45-50	**11.33**	**4.45**	**1.75**
50-55			
55-60			
60-65			
average ratio	6.16	2.79	1.38
average ratio reliable data	9.43	3.86	1.84

For reliable data, geometric mean 2004 stable erosion rates were, on average, a factor of 3.14 higher than 1995 unstable erosion rates, with multipliers ranging from 01.89 to 4.03.

Unstable erosion rates from the 2004 study were generally lower than the 1995 erosion rates in the lower wind speed bands (0.26 ratio at 15-20 mph and 0.89 at 20-25 mph), where data were unreliable. Reliable unstable 2004 erosion rates were generally 3.86 x higher than 1995 erosion rates in the 25-40 mph wind bands, with ratios ranging from 3.44 to 4.00.

The higher average unstable ratio values likely occurred for three reasons:

1) Unstable 2004 sites were "fresh" and had not had time to re-crust or be partially depleted.

Unstable sites for the 2004 study were created by disturbing stable soil surfaces with a metal rake, and then measuring the erosion rate immediately, before the surface could restabilize. In the 2004 study, objective methods, based on a sequence of the ball drop test, vegetation coverage, and percent nonerodible rock cover, were used to classify field sites as stable or unstable. Use of these objective methods resulted in classification of 31 of the 32 measured 2004 sites, as found, as "stable". Because of this finding, it was decided to intentionally create unstable surfaces with a metal gravel rake, to obtain a comparison of erosion rates from fresh unstable sites (worst-case scenario) to the same sites in stable conditions.

Soil surfaces were not intentionally destabilized in the 1995 study. Unstable sites were measured when found in field surveys. The age of the unstable (or recently destabilized) surfaces in the 1995 study was not known. Some of the 1995 sites may have been partially depleted of fine erodible material, or may have been partially re-stabilized. Our 1995 field notes are not sufficiently detailed to allow us to interpret the degree of instability. The 1995 field methods classified sites as stable or unstable by visual inspection of the physical sites (originally classified as "disturbed" or "undisturbed", followed by re-examination of the site photos in 1999-2000 to reclassify sites as "stable" or "unstable"

2) There are more Unstable sites in 2004 than in 1995. The result of the intentional destabilization is that there are 32 intentionally unstable sites in the 2004 study, compared to 29 as-found unstable sites in the 1995 study.

3) There are more unstable measurement per site in 2004 than in 1995.
Only one set of three or four velocity runs at each unstable site in 1995. In the 2004 study, three runs were performed at different locations on each site. Each run consisted of 4 velocity steps. Therefore, each of the 32 sites had three sets of four velocity increments in 2004, compared to one set of three or four velocity increments for 29 sites in 1995.

Because of the lower number of unstable datapoints in the 1995 study, we intentionally planned a change in field methods to create a larger unstable dataset in the 2004 field study. Field measurement methods for the 2004 wind tunnel study were purposely changed to increase the number of unstable wind erosion data points. This was done because of the because of differences in sampling methods. In the 2004 study, the wind tunnel was moved three times at each study site, and obtained erosion data at each wind speed from a soil surface that likely had been depleted less than during the 1995 study, where the tunnel was run in place for 10 minutes at each increasing wind speed.

4) There may have been less PM-10 depletion during each run in the 2004 field study. The 2004 field study employed shorter periods (4.0 minutes) of steady-state erosion at

each velocity compared to the 1995 study (10 minutes), so that the average erosion rate was calculated on a surface that had not been depleted of erodible particles for as long a period as during the 1995 study. This was done because the 2004 field study used four progressive step increases in erosion velocity during each wind tunnel run, each step of duration 4 minutes, with a total run length of 16 minutes for the four velocity steps.

To conclude, the combination of intentional destabilization at a higher number of sites, with more measurements per site (reasons 2 and 3 above) created a much larger 2004 unstable data set than the 1995 data set. The 1995 data set is thinly populated in some wind speed bands (Table 3) because there were only three runs per site at a smaller number of as-found unstable sites. Additionally, erosion rates are higher in 2004 because the sites were freshly destabilized, as opposed to likely having been partially depleted or re-crusted in 1995.

Change in Erosion rates, Stable to Unstable

Table 5 compares the Unstable/Stable erosion ratios for 2004 and 1995 wind tunnel field study data.

Table 5. Computed Ratios of 2004 Unstable to Stable wind erosion rates and 1995 Unstable to Stable wind erosion rates, averaged over all Wind Erodibility Groups. Computed ratios for which data set sizes are less than 10 are shown in **bold underlined font**

ALL WEG Unstable/Stable ratios - 2004			
wind band (mph)	**geo mean - 1 std.dev flux, ton/acre/hr**	**geo mean flux ton/acre/hr**	**geo mean + 1 std.dev flux, ton/acre/hr**
10-15	1.03	1.04	1.04
15-20	0.87	0.80	0.74
20-25	1.93	1.52	1.20
25-30	1.28	2.12	3.52
30-35	2.57	2.16	1.81
35-40	2.85	2.28	1.82
40-45	3.27	2.79	2.38
45-50	**2.81**	**2.47**	**2.18**
50-55			
55-60			
60-65			
average, 10-25 mph		1.12	
average, 25-50 mph		2.36	

ALL WEG Unstable/Stable ratios- 1995			
wind band (mph)	**geo mean - 1 std.dev flux, ton/acre/hr**	**geo mean flux ton/acre/hr**	**geo mean + 1 std.dev flux, ton/acre/hr**
10-15			
15-20	**N/A**	**2.54**	**N/A**
20-25	**3.90**	**3.77**	**3.63**
25-30	1.24	2.49	4.97
30-35	1.55	1.46	1.38
35-40	0.98	2.36	5.69
40-45	**1.14**	**1.91**	**3.22**
45-50	**0.32**	**0.94**	**2.75**
50-55		**0.34**	
55-60			
60-65			
average, 15-25 mph		3.15	
average, 25-50 mph		1.83	

In 2004, the average ratio of Unstable/Stable erosion rate was 1.12 in the 10-25 mph wind bands, and 2.36 in the 25-50 mph wind bands. The data are flat in the 10-25 mph wind bands, increase between the 20-25 mph and 25-30 mph wind bands, and then plateau again in the 25-50 mph wind bands. This can be distinctly seen in Figure 5.

Compared to 1995, the average Unstable/Stable ratio for 2004 is lower in the10-25 mph wind bands, and higher in the 25-50 mph wind bands.
In 1995, the average ratio of Unstable/Stable erosion rate was 3.15 in the 10-25 mph wind bands, and 1.83 in the 25-50 mph wind bands. The ratio data tend to decrease with increasing wind speed (Figure 6).

Some of the 1995 wind band data are thinly populated (data set sizes less than 10). These “thin” ratios are shown in **bold underlined font** in Table 5. The small dataset sizes may contribute to unreliable estimates of the anticipated increase in wind erosion rate that accompanies destabilization of a soil surface, and an erratic, declining ratio pattern with increasing wind speed (Figure 6)

In contrast, the 2004 data, with much larger data set sizes, show a more consistent pattern of negligible increase in the lower wind bands, and a plateau in the higher wind bands (Figure 6).

Figure 5. Plot of Unstable/Stable flux ratio data for 2004, averaged over all Wind Erodibility Groups. The 47.5 mph data point should be considered unreliable (n < 10).

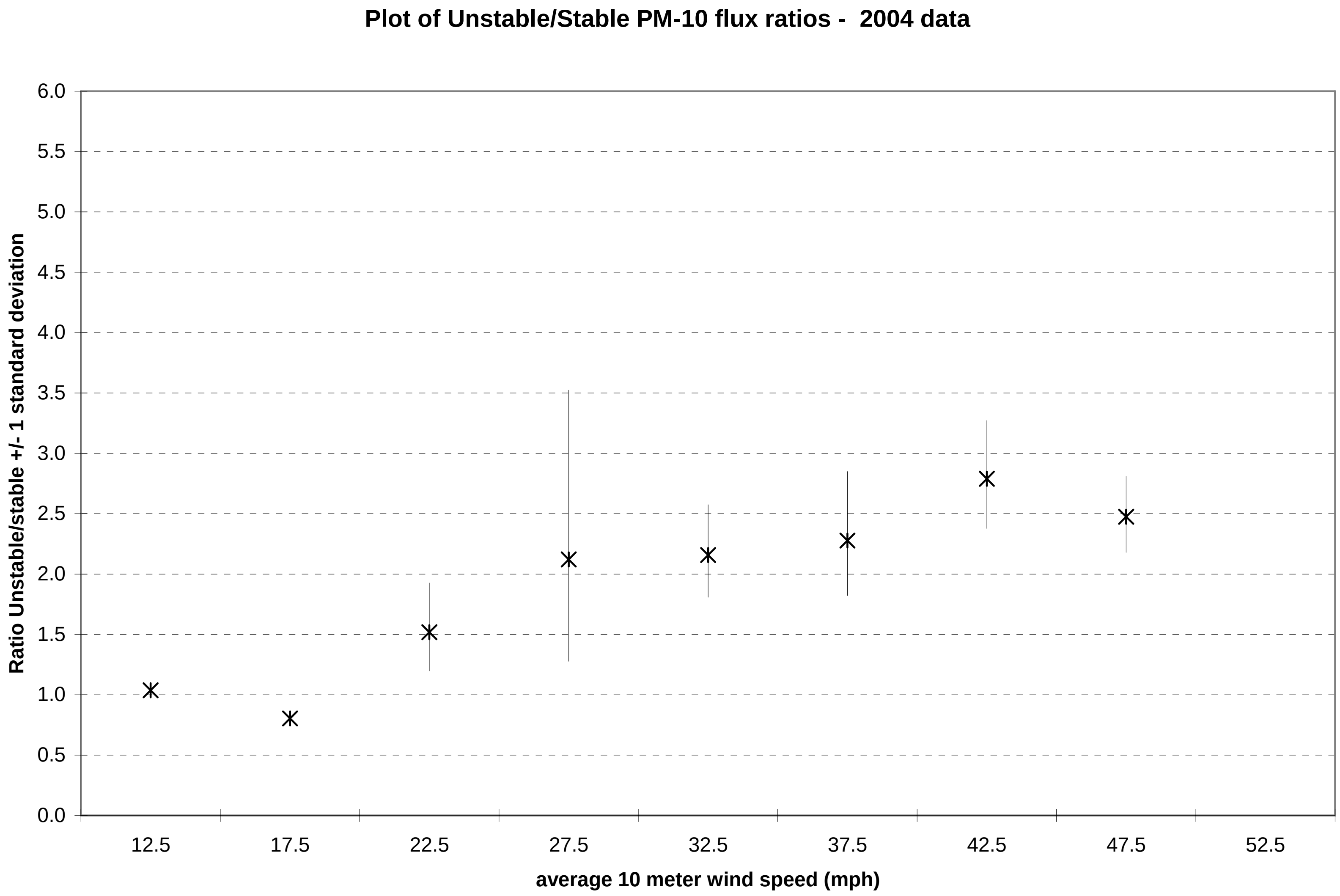


Figure 6. Plot of Unstable/Stable flux ratio data for 1995, averaged over all Wind Erodibility Groups. The 17.5, 22.5, 42.5, 47.5 and 52.5 mph wind band data should be considered to be unreliable (n < 10).

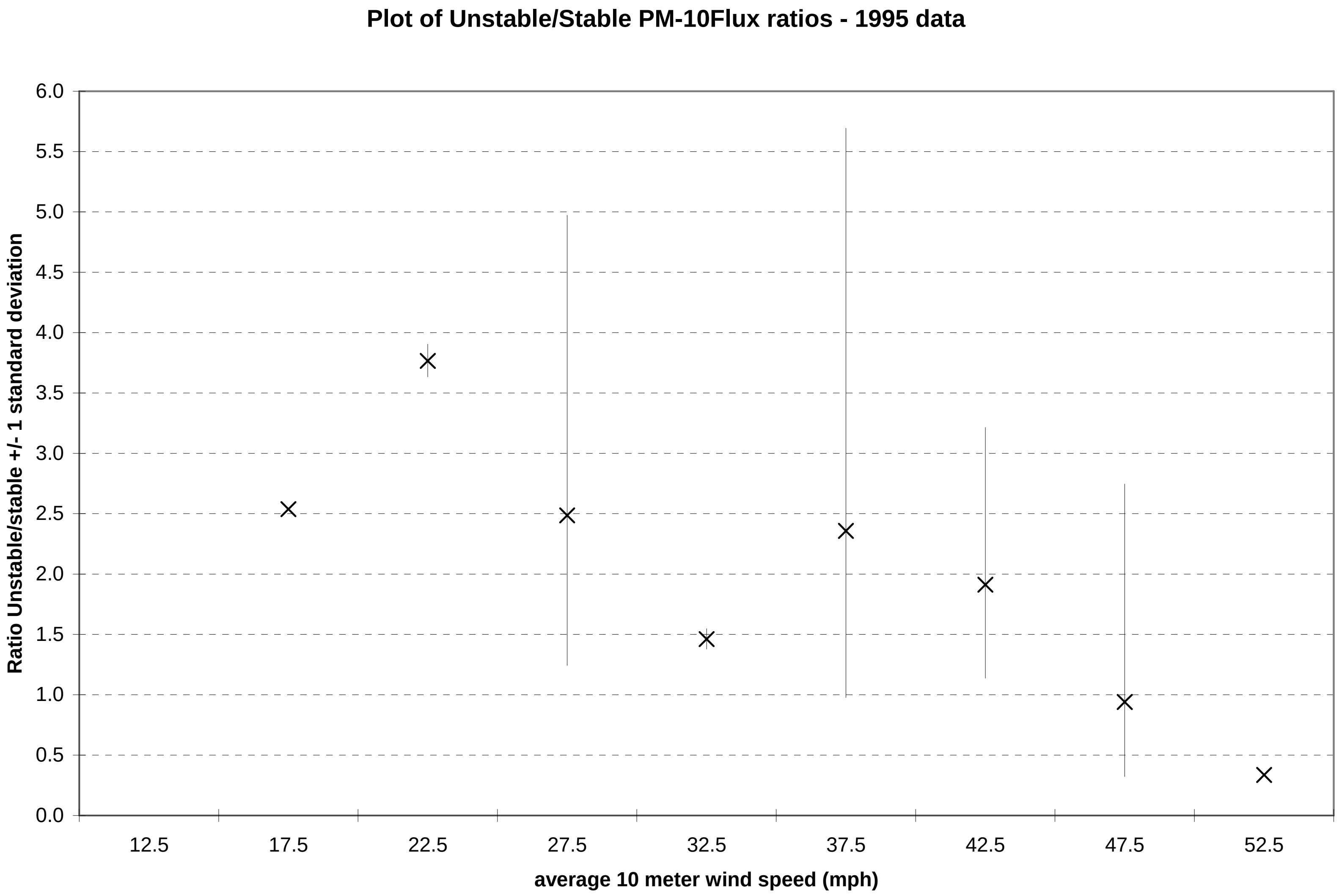


Figure 5 shows two distinct zones for the 2004 data set. The 12.5 (10-15mph) and 17.5 (15-20) mph wind bands show no increase in erosion rate for unstable surfaces compared to stable surfaces. The 20-25 mph is a transitional zone with an unstable wind erosion rate about 1.5x the stable value. The 27.5-37.5 mph wind bands show a plateau where the unstable erosion rate is about 2.2x the stable rate. The 47.5 mph wind band (unreliable) shows an erosion rate comparable to the 27.5-37.5 mph wind bands.

In contrast, Figure 6, shows erratic decline in the Unstable/Stable ratios for the reliable data in the 27.5 to 37.5 mph wind bands, with unstable rates ranging from about 1.5x in the 30-35 mph (plotted as 32.5 mph) wind band to 2.5x in the 25-30 mph (plotted as 27.5 mph) wind band.

Comparison of 2004 Stable land emission factors to 1998-1999 Stabilized Land emission factors.

Table 6 shows stabilized soil surface emission factors developed as part of a 1998-1999 wind tunnel study to evaluate the long-term weathering performance of seven commercially available dust suppressants applied to soil surfaces in Clark County. Reported data available for three wind bands range from 1.1×10^{-4} to 2.7×10^{-4} ton/acre/hour, generally one to one and a half orders of magnitude lower than values reported for stable lands in Table 1.

Table 6. Emission factors for <u>stabilized</u> dust-suppressant-treated soil surfaces. Surfaces are intact. Suppressant weathering ages range from one to five months.

Phase II Results - Intact dust suppressants - Spike corrected				
Wind Band	Geom mean flux	Geom mean flux	Geom mean flux	Number
(mph)	-1 Std. Dev.		+1 Std. Dev.	of runs
	(ton/acre/hr)	(ton/acre/hr)	(ton/acre/hr)	spike corrected
10-15				N/A
15-20	1.00E-04	2.65E-04	7.04E-04	18
20-25	5.24E-05	1.38E-04	3.65E-04	32
25-30	1.92E-05	1.09E-04	6.19E-04	18
30-35	N/A	N/A	N/A	2
35-40	N/A	N/A	N/A	N/A
40-45	N/A	N/A	N/A	N/A
45-50	N/A	N/A	N/A	N/A
50-55	N/A	N/A	N/A	N/A
55-60	N/A	N/A	N/A	N/A
60-65	N/A	N/A	N/A	N/A

Reported data for stabilized soils emission factors, from Table 6, expressed as a ratio to emission factors for all stable wind erodibility groups, from Table 1, are shown in Table 7. Results indicate that recently-applied dust suppressants have emission factors ranging from 0.4% to 18.6% of the values for wind erodibility groups.

Table 7. Ratio of emission factors, stabilized soils to stable soils.

Emission factor ratio of stabilized soils to (all WEG stable soils), as %			
Wind Band	Geom mean flux	Geom mean flux	Geom mean flux
(mph)	-1 Std. Dev.		+1 Std. Dev.
	(ton/acre/hr)	(ton/acre/hr)	(ton/acre/hr)
10-15			
15-20	18.6%	16.5%	14.7%
20-25	5.9%	4.5%	3.4%
25-30	0.4%	1.1%	3.1%
30-35	N/A	N/A	N/A
35-40	N/A	N/A	N/A
40-45	N/A	N/A	N/A
45-50	N/A	N/A	N/A
50-55	N/A	N/A	N/A
55-60	N/A	N/A	N/A
60-65			

Reported data for stabilized soils emission factors, from Table 6, expressed as a ratio to emission factors for all unstable wind erodibility groups, from Table 2, are shown in Table 8. Results indicate that recently-applied dust suppressants have emission factors ranging from 0.3% to 21.5% of the values for wind erodibility groups.

Table 8. Ratio of emission factors, stabilized soils to unstable soils.

Emission factor ratio of stabilized soils to (all WEG unstable soils), as %			
Wind Band	Geom mean flux	Geom mean flux	Geom mean flux
(mph)	-1 Std. Dev.		+1 Std. Dev.
10-15			
15-20	21.5%	20.6%	19.8%
20-25	3.1%	3.0%	2.9%
25-30	0.3%	0.5%	0.9%
30-35	N/A	N/A	N/A
35-40	N/A	N/A	N/A
40-45	N/A	N/A	N/A
45-50	N/A	N/A	N/A
50-55	N/A	N/A	N/A

For the purposes of planning reductions for a State Implementation Plan, if the data in Table 8 were to be expressed as a *percentage reduction* in emissions factors, defined as (100% - tabulated value in Table 8), the reductions would range from 78.5% to 99.7%. Results from Table 8 shown as percentage reductions, are shown in Table 9.

Table 9. Percent reduction of unstable land emissions factors resulting from stabilization by recently applied commercially available dust suppressants.

Percentage unstable EF reduction from dust suppressant stabilization			
Wind Band	**Geom mean flux**	**Geom mean flux**	**Geom mean flux**
(mph)	**-1 Std. Dev.**		**+1 Std. Dev.**
10-15			
15-20	**78.5%**	**79.4%**	**80.2%**
20-25	**96.9%**	**97.0%**	**97.1%**
25-30	**99.7%**	**99.5%**	**99.1%**
30-35	**N/A**	**N/A**	**N/A**
35-40	**N/A**	**N/A**	**N/A**
40-45	**N/A**	**N/A**	**N/A**
45-50	**N/A**	**N/A**	**N/A**
50-55	**N/A**	**N/A**	**N/A**

As a simple worst-case rule of thumb, the stabilized land emissions factors could be estimated to be approximately one-fifth (20%) of the emissions from unstable lands. Best case reduction could be estimated to be approximately a 99% reduction of unstable land emissions factors.

Velocity threshold for initiation of erosion, 1995

The following method was used to develop the threshold information in 1995.

1) Close the damper until a spike occurred, record the pitot tube pressure drop corresponding to that threshold, perform the velocity profile measurements at that pressure drop while the tunnel was running, and then continue to close the damper until the desired test velocity for that run was achieved, then hold that velocity for 10 minutes.

The tunnel was run in exactly the same place three or four times, each time for 10 minutes, with each successive velocity being higher than the previous one. The tunnel was therefore eroding a depleted surface each time.

Results for the 1995 wind tunnel study are shown in Table 10 below. The mean velocity for 56 stable sites was 27 mph. The mean for 29 unstable sites was 26.4 mph. The 16th percentile value for stable sites was 21.8 mph. The 16th percentile value for unstable sites was 22.2 mph. Results for unstable sites and stable sites are not significantly different. For its 2001 SIP, Clark County used a threshold of 25 mph for its Natural Events Action plan

Table 10. 1995 Wind tunnel study threshold values for initiation of erosion.

Table D.1 Statistical summary of aerodynamic roughnesses and PM-10 spike velocities
All soils

Unstable (disturbed) sites (new classification) n = 29			
		computed	extrapolated
category	aero roughness (cm)	spike velocity @ 7.6 cm (mph)	spike velocity @ 10 m (mph)
minimum	0.0027	9.6	18.2
mean - 1 std.dev	0.0139	11.3	22.2
mean	0.0514	13.0	26.4
mean + 1 std.dev	0.1898	14.9	31.3
maximum	0.4099	17.3	37.1

Stable (undisturbed) sites (new classification) n = 56			
		computed	extrapolated
category	aero roughness (cm)	spike velocity @ 7.6 cm (mph)	spike velocity @ 10 m (mph)
minimum	0.0001	6.7	12.4
mean - 1 std.dev	0.0124	10.9	21.8
mean	0.0712	12.7	27.0
mean + 1 std.dev	0.4106	14.7	33.4
maximum	0.4899	19.1	39.1

The data show that a 16th percentile ((mean – 1 standard deviation, so that 84% of the data exceeded these values) velocity threshold, extrapolated to a measurement at 10 meters from the velocity profiles observed in the wind tunnel, was 22.2 mph for sites rated as unstable, and 21.8 mph for sites rated as stable. A value of 20 mph was used in the Valley-wide estimates prepared by UNLV for Clark County in 2000 and 2001.

Velocity threshold for initiation of erosion, 2004

Compared to the 1995 field study, wind tunnel threshold measurement techniques were changed during the 2004 field study.

In 1995, the tunnel bypass damper was placed in the open position, flow was initiated in the tunnel, and the damper was then closed until a PM-10 concentration signal (or "spike") exceeding 1 mg/m^3 was observed on the TSI Dust-Trak® . The damper was held in this position and the tunnel velocity profile was performed. Once the aerodynamic roughness was calculated, the pitot tube tunnel center-line pressure drop associated with the spike was converted to a wind velocity at 10 meters. This velocity was interpreted as the threshold for initiation of PM-10 erosion. TSI PM-10 data were not recorded during the profiling run and the duration of the profiling run was variable. The tunnel was then operated in the same place for three or four 10 minute runs. Each run was at a constant velocity, and the three velocities were at progressively higher speeds.

In the 2004 study, the tunnel bypass damper was placed in the open position, flow was initiated, and the velocity profile was performed with the damper in the open position. Once pitot tube profiling was completed, the tunnel continued to run with the damper in the wide open position until five minutes were completed. TSI PM-10 data were recorded during the profiling run. The aerodynamic roughness was used to estimate the 10-meter velocity corresponding to the wide open damper position. The tunnel was then operated for four or five progressively increasing velocity steps. The steps were created by moving the damper until each pre-determined pitot tube center line pressure drop was observed and then holding the damper at each position usually for 4.0 minutes.

Because of this change in field technique, velocities for initiation of a 1 mg/m^3 PM-10 “spike” are not available in the 2004 data set. Many of the 2004 profiling data sets obtained at the wide-open damper position do show a “spike” at the wide open damper position.

Net PM-10 erosion rate data from the 2004 field study were extracted from the 2004 flux calculation database for both stable and unstable field sites, and were statistically analyzed to see if one could calculate a threshold velocity below which there was little or no observed PM-10 flux. Two techniques were used to analyze the 2004 data for velocity thresholds:

1) Extract all wide open damper velocity and PM-10 flux data for stable and unstable cases (regardless of Wind Erodibility Group) and calculate means and standard deviations for fluxes obtained in several velocity ranges

2) Extract all stable and unstable data (regardless of Wind Erodibility Group) and plot the data to see if they show a definite trend towards low or zero flux at a specific velocity.

Results for Method 1) are shown in Table 11.

Table 11 – 2004 stable profile run data. Average velocities for several low PM-10 flux ranges

Stable

Flux range ton/acre/hour	Mean velocity	Standard deviation	Sample size
< 10-5	15.6	1.6	12
> 10-5 and < 10-4	15.3	0.7	3
> 10-4 and < 10-3	15.3	2.7	22
> 10-3 and < 10-2	15.4	1.8	59

Unstable

Flux range ton/acre/hour	Mean velocity	Standard deviation	Sample size
< 10-5	15.8	2.5	11
> 10-5 and < 10-4	16.3	0.4	2
> 10-4 and < 10-3	15.7	2.3	28
> 10-3 and < 10-2	16.1	2.4	54

Examination of the data in Table 11 shows that there is no observable trend towards lower velocities in the lower profiling flux ranges. A threshold for initiation can’t be established from this method.

Results for Method 2) are shown in Figures 7 and 8.

Figure 7, a log-scale plot of all stable flux data (n = 465) shows that there are measurable PM-10 fluxes (12 zero values are omitted) to the lowest velocities observed in the wind tunnel study. The minimum velocity in the stable data set is 10.3 mph. No flux data are available for velocities below this value. As a worst-case scenario, it is recommended that stable flux data from the 10-15 mph wind band be used for hourly average winds less than 10 mph.

Figure 8, a log-scale plot of all non-zero unstable flux data (n = 460) also shows that there are measurable PM-10 fluxes (11 zero values are omitted) to the lowest velocities observed in the wind tunnel study. The minimum velocity in the unstable data set is 11.4 mph. No flux data are available for velocities below this value. As a worst-case scenario, it is recommended that unstable flux data from the 10-15 mph wind band be used for all hourly average winds less than 10 mph.

Figure 7. Logarithmic plot of all non-zero 2004 Stable flux data against 10-meter wind speed (n=465). Zero flux values (n=12) are omitted

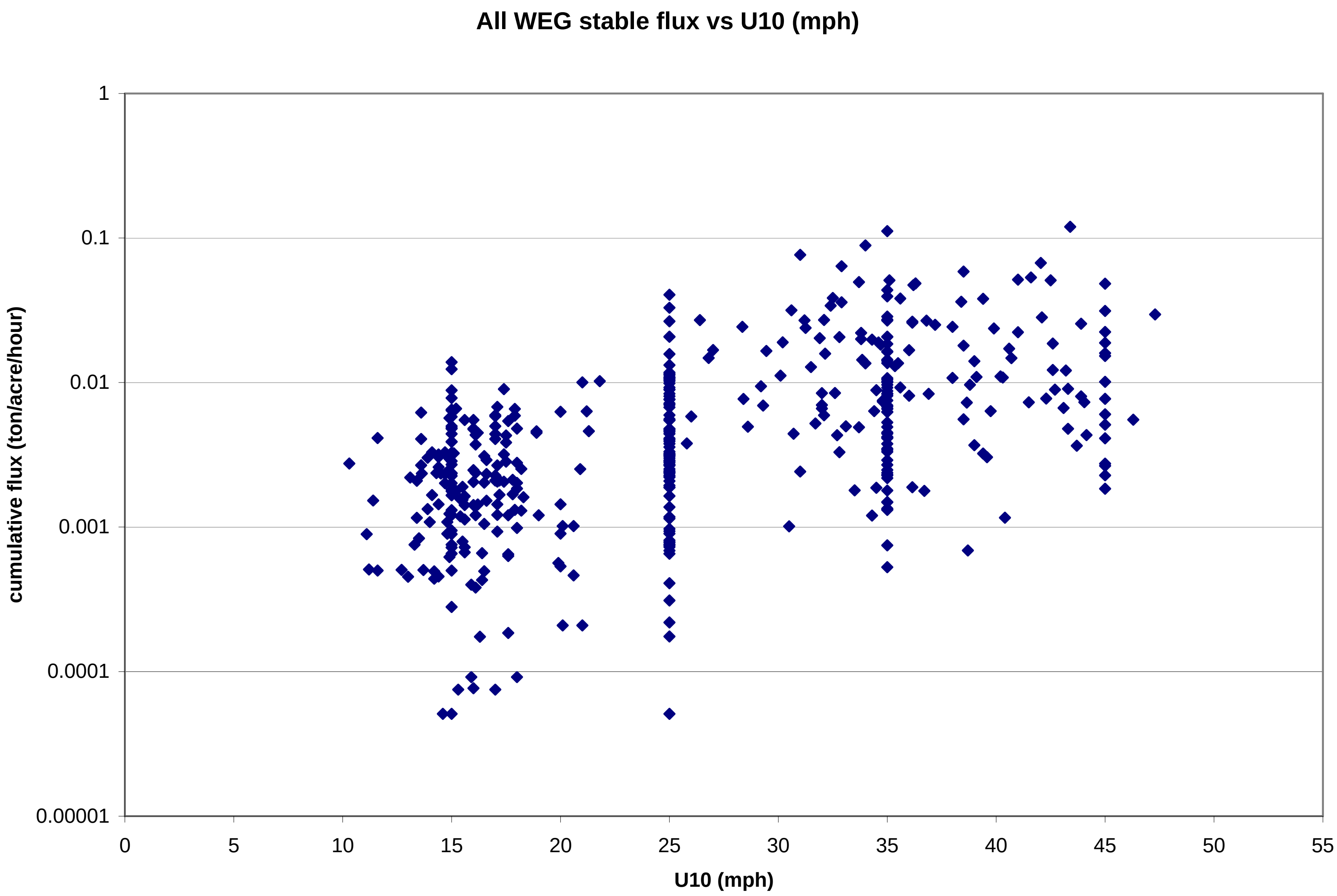
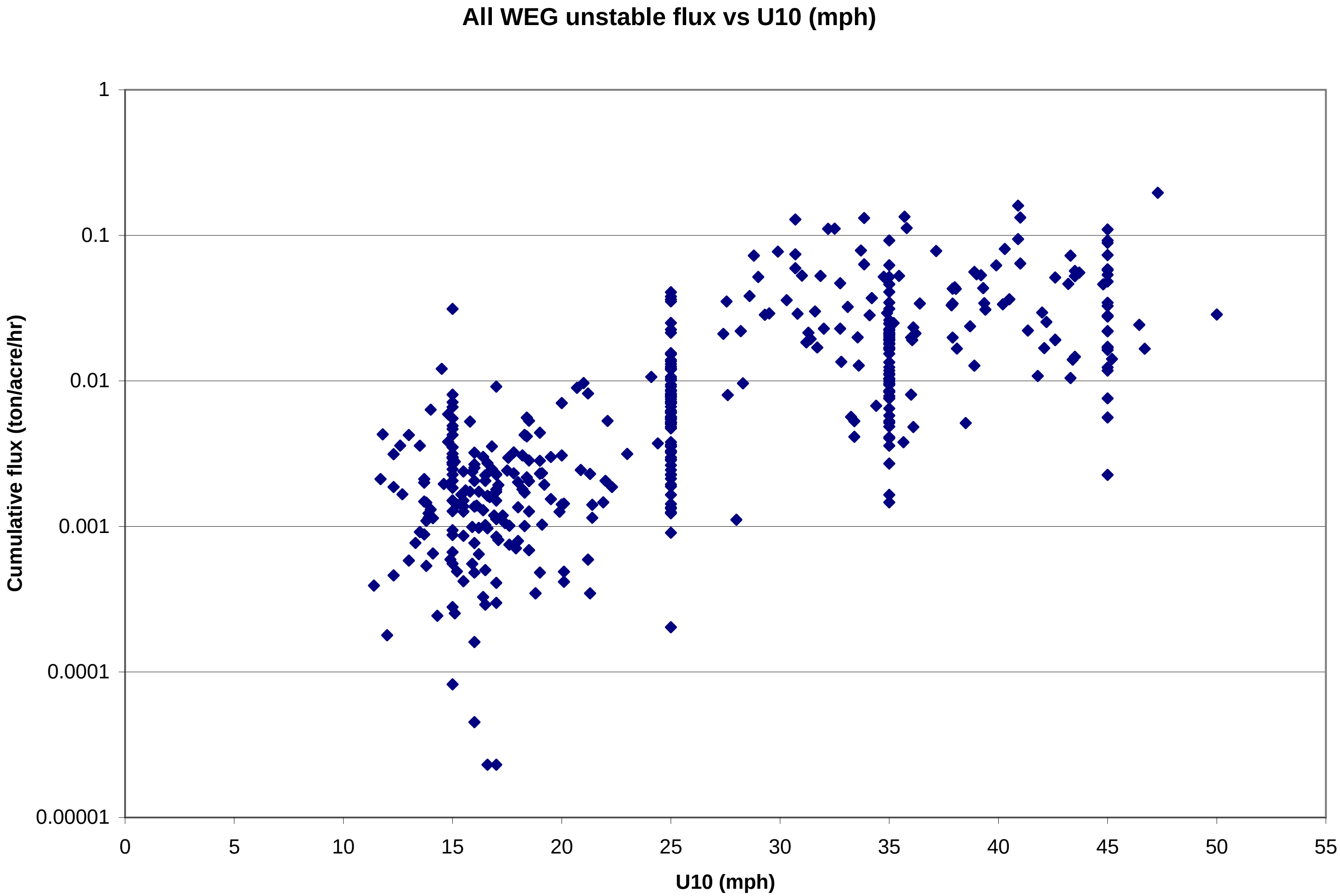


Figure 8. Logarithmic plot of all non-zero 2004 Unstable flux data against 10-meter wind speed (n=460). Zero flux values (n= 11) are omitted.



Threshold velocities for Natural Events Action plan

Data from the 2004 wind tunnel study were examined to determine a 10-meter velocity threshold for significant non-linear increases in PM-10 flux. Two approaches were used 1) Raw flux data from all wind tunnel sites were plotted on a linear scale and examined for a nonlinear increase in erosion rate. The plots are shown in Figures 9 and 10.

2) Processed logarithmic mean and standard deviation flux data, already plotted in Figures 1 (stable) and 3 (unstable), were examined for a “slope break” to see if a transition from lower to higher PM-10 flux rates could be established.

Results for Method 1) are plotted in Figures 9 and 10.

Figure 9 for Stable surfaces shows that:
a) below 25 mph, the majority of Stable PM-10 fluxes, with four exceptions, are below 0.010 ton/acre/hour.
b) the Stable PM-10 flux distribution broadens to values well above 0.010 ton/acre/hour at velocities above 25 mph.

Figure 10 for Unstable surfaces shows the same pattern as the figure for Stable fluxes:
a) below 25 mph, the majority of Unstable PM-10 fluxes, with four exceptions, are below 0.010 ton/acre/hour.
b) the Unstable PM-10 flux distribution broadens to values well above 0.010 ton/acre/hour at velocities above 25 mph.

Figure 9-10 data indicate that a non-linear increase in PM-10 flux begins to occur once 10-meter velocities exceed 25 miles per hour.

Results for Method 2, plotted in Figures 1 and 3, show a slope “break” occurs in the 20-25 mph (22.5 mph plotting point) wind band. PM-10 flux rates for velocities above the 20-25 mph wind band are about one order of magnitude higher than PM-10 flux rates for velocities below the 20-25 mph wind band.

Figure 9. Linear plot of Stable PM-10 flux against 10-meter wind speed. All Wind Erodibility groups. n = 477

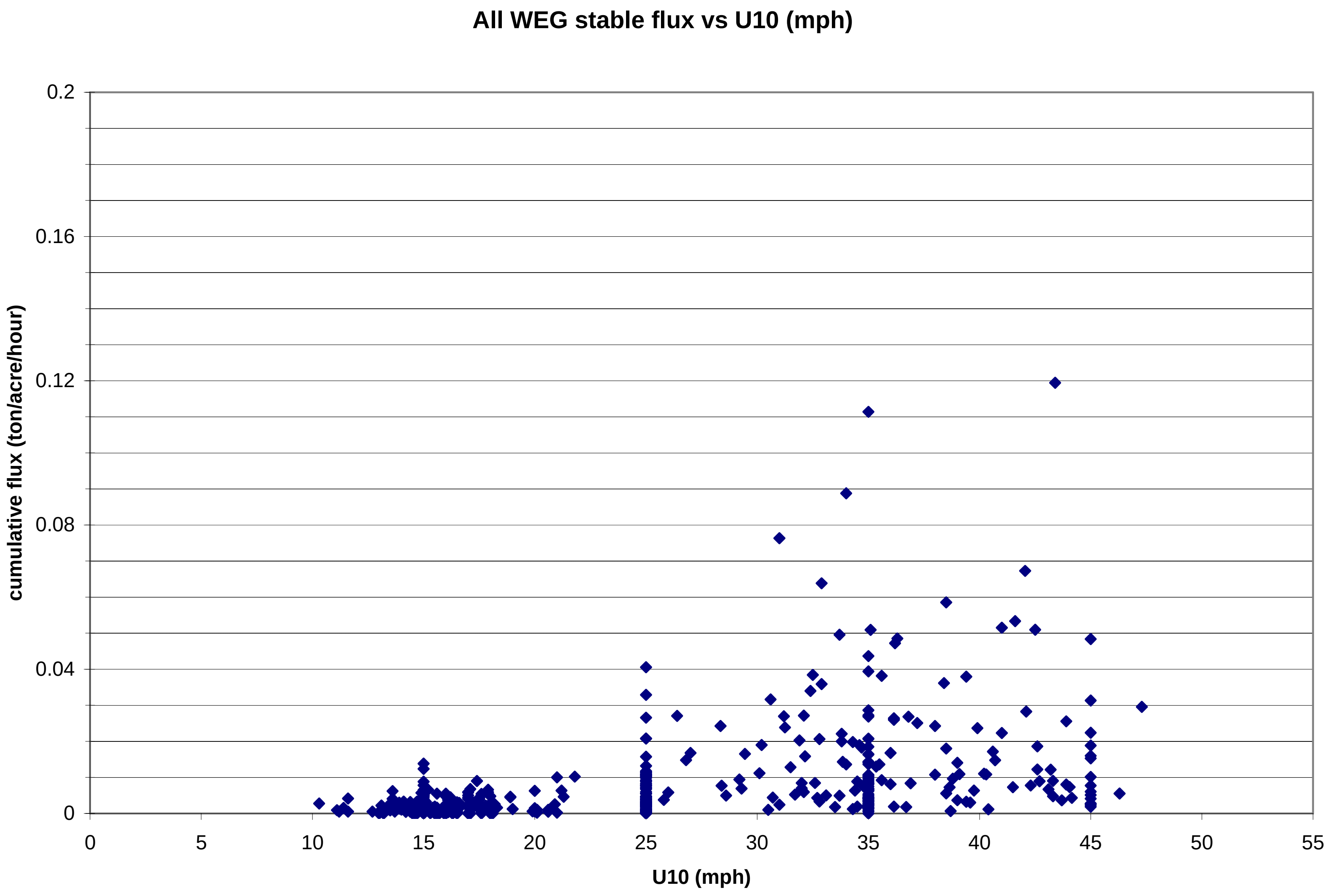
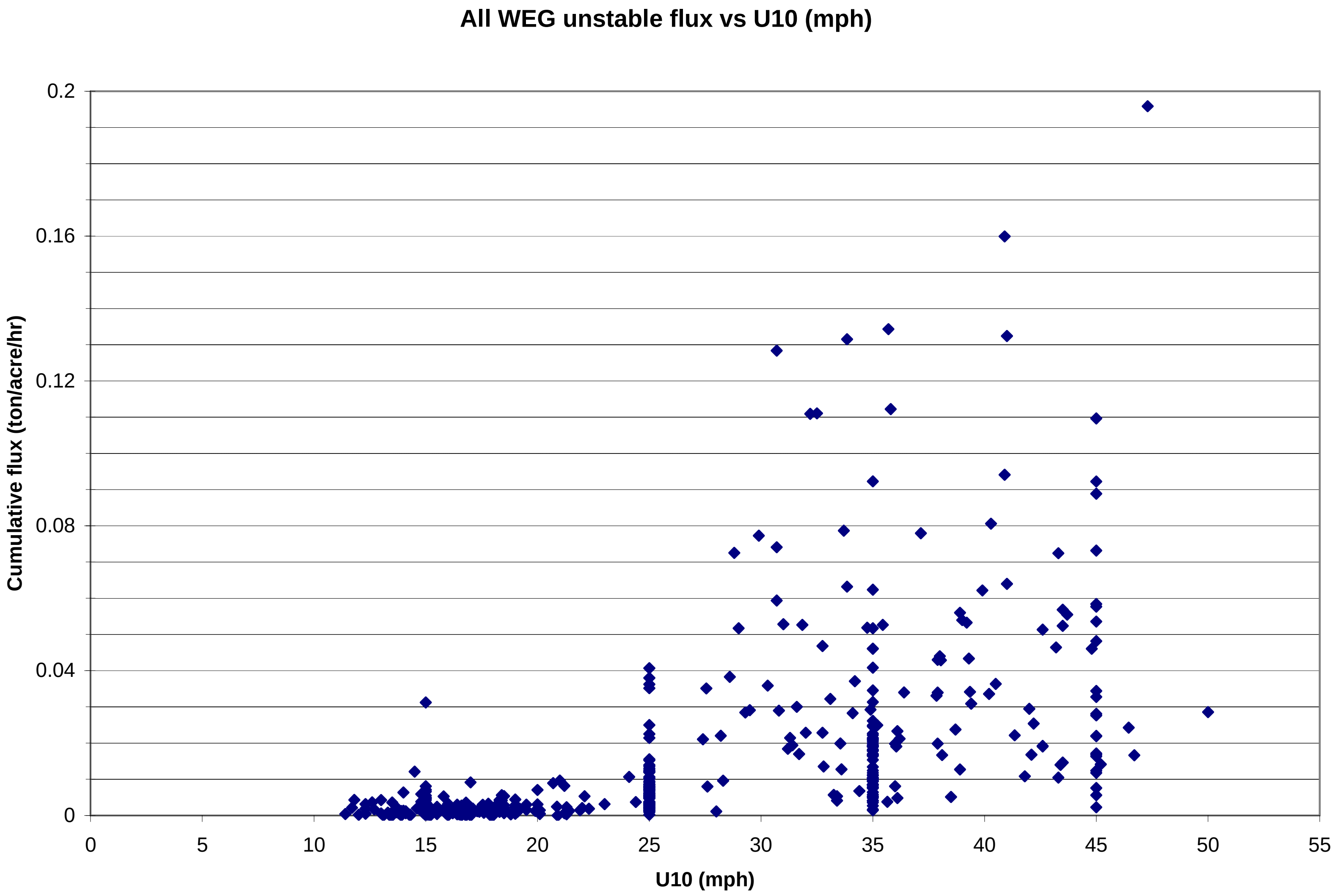


Figure 10. Linear plot of Unstable PM-10 flux against 10-meter wind speed. All Wind Erodibility groups. n = 471



Impacts of changes from 1995 to 2004 for SIP purposes

1) Comparing absolute flux rates 2004 to 1995.
  a) From Table 2, Stable 2004 fluxes were
    i) 18% lower in the 15-20 mph wind band (1995 data unreliable in this band), and
    ii) ranged from 1.7X to 4.0X higher in the 20-25 mph and higher wind bands,
  b) From Table 4, Unstable 2004 fluxes were
    i) 74% lower in the 15-20 mph wind band (1995 data unreliable) and 11% lower in the 20-25 mph wind band
    ii) ranged from 2.8X to 4.4X higher in the 20-25 mph and higher wind bands.

2) Comparing unstable to stable flux rates.
From Table 5, for modeling impacts of converting Unstable land to Stable land
  a) compared to 1995, the 2004 data are much more reliable than the 1995 data because of larger sample size.
  b) the 2004 show a
    i) no increase in flux compared to stable lands below the 20-25 mph (22.5 mph plotting point) wind band
    ii) a transitional increase where unstable fluxes are 1.5X higher than stable in the 22.5 mph wind band, and
    iii) a consistent Unstable/Stable ratio of about in the 2.2 to 2.7 range above a threshold of 22.5 mph (20-25 mph wind band),

The Unstable/Stable ratios for the 1995 data set are unreliable at the low and high ends of the wind-band ranges, but, in the middle wind bands (27.5 to 37.5 mph) where reliable data are available, they range from 2.5 to 1.5, and do not show a consistent pattern.

3) Thresholds for Initiation of PM-10 erosion. The 1995 data showed a distinct threshold for initiation of erosion of about 20-22 mph (Table 10). The 2004 data do not show a threshold for initiation of PM-10 erosion, and exhibit measurable fluxes at 10-meter velocities as low as 10-11 mph (Figures 7 and 8) Although some sites showed zero net flux in the 10-15 mph wind band, other field sites did exhibit measurable fluxes in the 10-15 mph wind ban. The difference in result is a consequence of a change in field measurement technique in 2004.

4) Natural Events Action Plan threshold. The 2004 data, analyzed by two methods show that non-linear increases in PM-10 flux generally begin occur at 10-meter velocities exceeding 25 mph. It is recommended that the 25 mph threshold for a natural event be used for planning purposes.

5) Effects of applying dust suppression to Unstable lands. Mean stabilized land PM-10 emission factors range from 1.1×10^{-4} to 2.6×10^{-4} ton/acre/hr (Table 6). The 2004 unstable

land PM-10 flux can be reduced by 78.5%-99.7% by application of dust suppressants (Table 9).