

PROPOSAL FOR FINAL RELEASE FOR WA008047 (Club)

Date: February 26<sup>th</sup>, 2009

Plant Breeder: K.K. Kidwell

Breeding Team Members:

K. K. Kidwell

R. E. Allan

G. B. Shelton

V. L. DeMacon

X. Chen

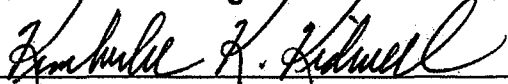
J. S. Kuehner

B.-K. Baik

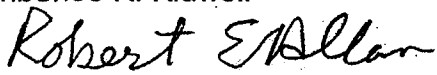
D. A. Engle

N. A. Bosque-Perez

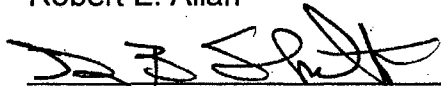
Endorsement Signatures of the Team:

  
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Kimberlee K. Kidwell

2/4/09  
Date

  
\_\_\_\_\_  
Robert E. Allan

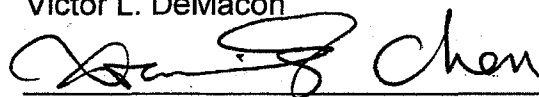
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Date

  
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Gary B. Shelton

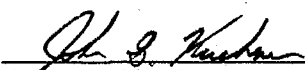
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Victor L. DeMacon

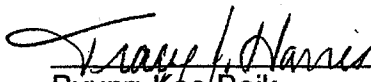
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Xiaming Chen

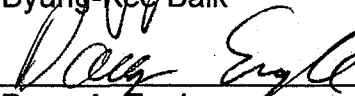
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John S. Kuehner

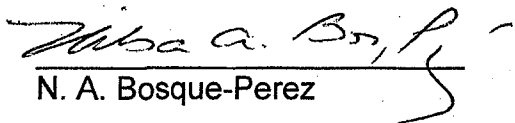
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Byung-Kee Baik

2/3/09  
Date

  
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Doug A. Engle

2-3-09  
Date

  
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N. A. Bosque-Perez

2-4-09  
Date

**A. Identification:**

1. **Crop Kind and Market Class:** Soft White Club Spring Wheat
2. **Selection No's:** C0400016, CL01006
3. **Proposed Name:** JD
4. **Pedigree:** Eden//Coda/PI 574357 (Wawawai sib)

*Spring Club*  
*No Heat Inty*  
*Bread Adaptation*  
*Q+ to Q\*\**

**B. General Situation**

1. **Preliminary Seed Increase Justification:** Since 2007, over 17,000 acres of spring club were grown in Washington State, generally in the southeast and south central wheat production regions. 100% of this acreage was sown to Eden, a 2002 release from this program. Although Eden has outstanding grain yield potential, it lacks high-temperature, adult-plant resistance (HTAP) to stripe rust, which greatly increases the risk of producing this variety in the high rainfall zone. The only other spring club variety currently available is Calorwa, which is highly susceptible to stripe rust. WA008047 (referred to as WA8047 throughout the rest of this request) has demonstrated high levels of resistance to stripe rust in field trials for the last 4 crop years. Based on controlled environment evaluations conducted by Dr. Chen, WA8047 was resistant to all stripe rust races tested in the seedling and adult plant stages. Releasing WA8047 will provide wheat producers with a stripe rust resistant, high yielding spring club variety with broad adaptation and excellent milling and baking quality. The availability of this variety will support the expansion of soft white club acreage in the region.
2. **Use type:** Soft white club cookie, cake and pastry wheat.
3. **Description:** Semi-dwarf, soft white spring club wheat with mid-season maturity, club head type, white straw and white glumes.
4. **Intention:** WA8047 is broadly adapted with the potential to be grown successfully in all production zones in eastern Washington. Due to the improved stripe rust resistance in WA8047 compared to current varieties, the spring club acreage in the high rainfall region where stripe rust is a major concern may increase. WA8047 may also supplant a portion of the Louise and Alpowa acreage in the intermediate and high rainfall zones due to its stripe rust resistance and superior yield potential.

**C. General Agronomics:**

1. **Agronomic performance:** WA8047 was evaluated in preliminary (2 site-years), state (9 site-years), and tri-state (6 site-years) breeding nurseries from 2005 through 2008 (Table 1), and at sixteen and 15 variety testing locations in 2007 and 2008, respectively (Tables 2-4). Based on seventeen site-years of breeding trial data, grain yield averages of WA8047 (57 bu/A) were similar to those of Eden (58 bu/A), and were significantly higher than those of Calorwa (51 bu/A) (Table 1).

Based on 2007-2008 variety testing data, WA8047 (31 bu/A) and Louise (32 bu/A) were not significantly different from one another in the semi-arid production region; however, grain yield averages of Eden (30 bu/A) and Alpowa (30 bu/A) were significantly lower than Louise (Table 2). Grain yield averages of WA8047 (51 bu/A)

were similar to those of Eden (52 bu/A), but were significantly less than those of Alpowa (54 bu/A) and Louise (56 bu/A) in the intermediate rainfall zone (Tables 3). Grain yield averages of WA8047 (74 bu/A) were similar to those of Eden (75 bu/A) and Alpowa (75 bu/A), but were significantly less than those of Louise (77 bu/A) in the high rainfall zone (Table 4). With irrigation, Alpowa (116 bu/A) produced significantly more grain than WA8047 (91 bu/A), Eden (96 bu/A) and Louise (93 bu/A) (Table 4).

## **2. Other Agronomic Traits:**

- a. **Plant height:** WA8047 was 1 to 5 and 2 to 7 inches taller than Eden and Calorwa, respectively, depending on location (Tables 1-4). WA8047 is slightly taller than Alpowa and slightly shorter than Louise.
- b. **Heading date:** The heading date of WA8047 was 1 to 3 days later than Eden depending on location, and similar to Louise and Alpowa across locations (Tables 2-4).
- c. **Test weight:** Test weight averages of grain from WA8047 were similar to those of Eden, and significantly higher than those of Calorwa, Alpowa and Louise (Tables 1-4).
- d. **Grain protein content:** Grain protein content averages of WA8047 were similar to those of Calorwa (Table 1), but higher than those of Eden (Tables 1-4).

## **3. Quality:** See Quality Assessment Report Provided by Morris et al (Pages 5-7).

Based on evaluation results from the 2009 PNW Quality Council, WA8047 was better than Eden for nearly every end-use quality parameter tested (data not shown but can be provided upon request). WA8047 had lower ash content and higher flour yield than that of Eden and comparable to the best quality winter clubs. Panel members preferred the dough handling characteristics of WA8047 over those of Eden. The baking quality of WA8047 was superior to that of Eden and both outperformed Chukar and Cara, two high quality winter club wheat varieties included in the study.

## **4. Resistance to diseases and insects:**

- a. **Stripe Rust:** WA8047 was tested on the Whitlow farm near Pullman and Mt. Vernon in breeding nurseries in 2005 (Table 5) and on the Spillman, Plant Path, and Whitlow farms near Pullman, Lind, Walla Walla, and Mt. Vernon in 2007 and 2008 under natural infection of stripe rust (Table 6-9). In these field nurseries, WA8047 was resistant to moderately resistant (ITs 0-5) in all tests. Compared to its susceptible parent Eden, WA8047 has much higher levels of resistance to stripe rust. When WA8047 was tested in the seedling stage in the greenhouse at low temperature cycles (diurnal temperatures gradually changing from 4 to 20°C), it was resistant (IT 2-3) to PST-17, 37, 45, 100, and 127; and had heterogeneous reactions to PST-116, the majority of plants were resistant (IT 3) (Tables 10 and 12). Additionally, when tested in the greenhouse, in the high-temperature (diurnal temperatures gradually changing from 10 to 35°C) adult-plant test, WA8047 was

resistant (IT 0-3) to PST-45, PST-100, PST-116 and PST-127 (Tables 11-12). Both seedling and adult-plant test results indicate that WA8047 has a high level resistance to stripe rust.

- b. **Leaf Rust:** No data available for assessment.
- c. **Powdery Mildew:** No data available for assessment.
- d. **Hessian fly:** Based on controlled environment insect screening evaluations conducted at the University of Idaho, WA8047 is susceptible (100%) to Hessian fly (HF) [(*Mayetiola destructor* (Say))] biotypes E, F and GP.
- e. **Russian wheat aphid:** Based on parentage, this variety should be susceptible to the Russian wheat aphid (*Diuraphis noxia* (Mordvilko)).
- 5. **Area of Adaptation:** WA8047 is broadly adapted but should not be grown where the likelihood of HF infestation is possible (>18 inches of average annual precipitation and/or in high residue management systems).
- 6. **Weakness:** The primary weakness of WA8047 is that it does not have Hessian fly resistance, which could impact its adaptation in the high rainfall region. HF typically is only problematic in high residue management systems, or in fields that are planted late due to inclement weather. A secondary weakness of WA8047, from a marketing standpoint, is that it typically has higher average whole grain protein content (.5%) when compared to Eden. Conversely, the protein quality of WA8047 is superior to that of Eden and mitigates this factor in regards to end-use quality.
- 7. **FGIS Results:** Thirteen of the sixteen samples submitted to FGIS in 2007 graded white club, whereas 3 samples graded western white. The fourteen samples submitted to FGIS in 2008 all graded white club.
- D. **Other Comments:** This release request is based upon the need for expanding spring club variety options with high levels of resistance to stripe rust. Since the yield potential of WA8047 is similar to Alpowa and Louise, this variety has the potential to supplant a substantial portion of the soft white common spring wheat acreage in the high rainfall zone where stripe rust pressure is expected.
- E. **Seed Source, Status, and Availability:** Approximately 1,464 pounds of Breeder seed were produced in 2008 and will be available as Foundation seed in 2009.

## Assessment of the End-Use Quality of WA8047 Soft White Spring Club Wheat

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Line designation(s): WA8047  
Market class/type: Soft White Spring Club  
Requesting breeder:  
Release status request:  Pre-Release  Full Release  Other  
Years of quality testing: 5 (Table 13)

Check varieties: Alpowa Alturas Eden Louise  
Maximum paired check comparisons: 20 17 33 27

### INTRODUCTION

Following is an assessment of the quality of WA8047. Assessment of wheat quality involves data interpretation and therefore may vary accordingly. Data are from the Western Wheat Quality Lab and the Washington State University Wheat Quality Program. These data represent standard cultivar development and nursery testing procedures.

Nurseries and the corresponding nursery numbers are described in Table 13. Experimental genotypes are evaluated by comparison to check varieties grown in the same nursery (same location-year) to minimize environmental confounding. Check varieties and their occurrence in various nurseries are listed in Table 14. For statistical purposes a limited number of check varieties are used. These are generally selected on the basis of class, current production, occurrence in nurseries, and known quality attributes. Statistical analyses are conducted as essentially paired t-tests using balanced designs. N (the number of paired comparisons) varies according to the test conducted. Table 15 present the analysis of variance by check variety for each quality parameter. LSDs assume an  $\alpha = 0.05$ . Table 16 lists the data used for analysis.

<u>Trait abbreviation</u>	<u>Trait name</u>	<u>Units</u>	<u>Comments</u>
TWT	Test weight	lbs/bu	limits set for U.S. grades
WPROT	Wheat Protein	%	--
SKHRD	Single Kernel Hardness	unitless	--
SKWT	Single Kernel Weight	mg	--
SKWTSD	Single Kernel Weight sd	unitless	--
FYELD	Flour Yield	%	--

BFYELD	Break Flour Yield	%	--
FASH	Flour Ash	%	lower values are preferred
MSCOR	Milling Score	unitless	--
FPROT	Flour Protein	%	--
FSV	Flour Swelling Volume		indicator of partial waxy
MABS	Mixograph Absorption	%	dough water absorption
CODI	Cookie Diameter	cm	--
CAVOL	Sponge Cake Volume	cc	--
LDOPA	L-DOPA	A <sub>475</sub>	polyphenol oxidase

**INTERPRETIVE SUMMARY FOR WA8047**  
(as compared to Alpowa, Alturas, Eden and Louise)

**Test weight** is greater than Alpowa, Alturas and Louise; similar to Eden.

**Grain protein** is similar to Alpowa, Alturas, and Louise; greater than Eden.

**SKCS kernel hardness** is similar to Eden; greater than Alpowa, Alturas and Louise.

**Kernel weight** is greater than Eden; similar to Alturas; less than Louise and Alpowa.

**Flour yield** is greater than Alpowa, Eden and Louise; similar to Alturas.

**Break flour yield** is greater than Alpowa; similar to Alturas, Eden and Louise.

**Flour Ash** is less than Alpowa, Alturas and Louise; similar to Eden.

**Milling score** is greater than all checks.

**Flour protein** is similar to Alpowa, Alturas and Louise; greater than Eden.

**Brookfield batter viscosity** is similar to Eden

**Flour swelling volume** indicates normal starch amylose

**Dough water absorption** is less than all checks.

**Cookie spread** is greater than all checks.

**Cake volume** is similar to Eden.

WA8047 has moderate to low Polyphenol Oxidase (PPO) activity.

## CONCLUSION

WA8047 displays good grain properties. It has good test weight and kernel weight with similar grain protein content to the common varieties although higher grain protein (0.6%) than Eden. Milling properties are very good and displays an improvement to established varieties. Dough water absorption is exceptionally low; in the range of winter club varieties. Cookie quality is very good, outperforming all checks and cake quality is good. WA8047 represents an overall improvement of the spring club subclass. Release is justified on quality considerations alone.

Overall, release of this variety is expected to:

- increase the overall quality of the wheat crop in Washington
- exert no positive or negative effect on the overall quality of the wheat crop in Washington
- have both positive and negative effects on the overall quality of the wheat crop in Washington
- have both neutral and negative effects.
- decrease the overall quality of the wheat crop in Washington
- depend upon the variety that it will replace/supplant, meaning that its effect could be any one or a combination of the outcomes above
- require special handling, segregation, etc. for the following reason(s):

## ACKNOWLEDGMENTS

The dedicated efforts of the following staff of the Western Wheat Quality Lab and Wheat Quality Program are gratefully acknowledged: Mary L. Baldrige, Tracy Harris, Gail Jacobson, Bozena Paszczynska, William J. Kelley, Pat K. Boyer, Eric Wegner, Shawna Vogl and Renee Engle (ret.). Special thanks to John Burns (ret.) and the WSU Cereal Variety Testing Program for providing many of the samples analyzed herein.

**Table 1:** Mean heading date (Julian), plant height (inches), grain protein content (%), test weight (lb/bu) and grain yield (bu/A) of WA8047 and check cultivars in field breeding trials from 2005 to 2008.

Location	Nursey Name	Precip. (in)		Heading Date				Plant Height				Grain Protein Content				Test Weight				Yield			
				WA8047	Eden	Calorwa	LSD @.10	WA8047	Eden	Calorwa	LSD @.10	WA8047	Eden	Calorwa	LSD @.10	WA8047	Eden	Calorwa	LSD @.10	WA8047	Eden	Calorwa	LSD @.10
Lind	Tri-State	<18	2008	161	159	155	*	21	18	20	*	13.7	12.8	13.6	*	62.1	61.8	61.3	*	18	19	20	1.8
	Tri-State		2007	155	150	149	*	21	20	21	*	13.0	12.2	12.9	*	62.7	62.9	61.2	*	26	27	30	2.2
	State		2008	161	157	153	*	20	19	19	*	13.2	12.5	13.5	*	60.9	61.3	60.3	*	17	20	20	1.4
	State		2006	155	154	152	*	27	23	23	*	12.1	11.0	12.1	*	62.6	62.2	61.5	*	36	33	28	2.7
	Preliminary		2008	160	157	155	*	19	21	18	*	13.1	12.3	13.4	*	62.1	61.4	61.2	*	19	20	18	1.6
Connell	Preliminary	2005	154	153	148	*	21	21	19	*	*	*	*	*	61.0	61.9	60.2	*	17	18	14	2.3	
	State	2008	156	154	152	*	20	19	18	*	14.3	13.4	14.7	*	59.8	61.5	60.1	*	17	17	15	3.1	
Dusty	State	2006	153	151	148	*	28	26	24	*	13.0	12.1	13.2	*	61.9	62.2	60.8	*	40	42	38	3.2	
	State	2006	163	161	158	*	33	31	28	*	11.5	10.0	11.5	*	61.7	61.4	59.5	*	57	66	49	14.2	
<b>Mean</b>				158	155	152	1.6	23	22	21	2.2	13.0	12.0	13.1	0.7	61.6	61.8	60.7	0.9	28	29	26	1.7
Pullman	Tri-State	>18	2008	179	177	175	*	32	30	27	*	9.9	8.5	9.7	*	62.4	61.1	60.3	*	72	78	66	5.7
	Tri-State		2007	164	163	160	*	34	32	29	*	11.2	10.8	10.7	*	63.2	63.0	61.4	*	78	79	71	3.4
	State		2008	178	177	174	*	32	29	26	*	8.9	8.3	9.1	*	62.2	61.7	61.1	*	71	74	65	4.8
	State		2006	175	176	173	*	35	33	30	*	11.5	10.3	11.8	*	61.2	61.0	57.7	*	74	73	61	4.3
	Preliminary		2008	179	179	175	*	32	30	27	*	9.7	9.0	8.4	*	58.6	59.1	57.0	*	69	78	66	8.3
Moses Lake	Preliminary	2005	175	175	173	*	34	30	23	*	12.5	11.2	12.4	*	61.0	59.5	57.2	*	58	38	28	4.5	
	State	2006	175	175	173	*	34	30	23	*	12.5	11.2	12.4	*	61.0	59.5	57.2	*	58	38	28	4.5	
<b>Mean</b>				175	175	172	2.7	33	31	27	3.5	10.6	9.7	10.4	0.6	61.4	60.9	59.1	1.1	70	70	59	2.3
Moses Lake	Tri-State	irr	2008	159	157	155	*	39	31	31	*	12.9	12.9	12.1	*	61.6	60.3	60.6	*	107	104	85	16.8
	Tri-State		2007	153	154	148	*	39	40	31	*	11.0	10.4	10.2	*	62.0	60.7	59.8	*	119	118	105	13.6
	State		2008	159	157	155	*	39	34	31	*	12.8	11.8	12.5	*	62.7	61.5	59.8	*	98	96	90	7.9
	State		2006	159	159	153	*	43	40	38	*	12.6	12.6	13.0	*	61.8	61.8	60.0	*	91	98	99	10.1
<b>Mean</b>				158	157	153	2.6	40	36	33	4.6	12.3	11.9	12.0	1.0	62.0	61.1	60.1	1.3	104	104	95	5.2
<b>Grand Mean</b>				163	162	159	1.1	30	28	25	1.7	12.1	11.2	11.9	0.4	61.7	61.4	60.1	0.9	57	58	51	1.5

Analysis Method: Analysis of Variance; na=not available.

\* not available



**Table 2: Mean heading date (Julian), plant height (inches), grain protein content (%), test weight (lb/bu) and grain yield (bu/A) of WA8047 and check cultivars in the 2007 and 2008 WSU Extension Uniform Cereal Variety Testing Spring Wheat Variety Performance Trials receiving less than 15 inches of average annual precipitation.**

Location	Precip. (in)		Heading Date					Plant Height					Grain Protein Content					Test Weight					Yield				
			WA8047	Eden	Alpowa	Louise	LSD @.10	WA8047	Eden	Alpowa	Louise	LSD @.10	WA8047	Eden	Alpowa	Louise	LSD @.10	WA8047	Eden	Alpowa	Louise	LSD @.10	WA8047	Eden	Alpowa	Louise	LSD @.10
Lind Fallow	<15	2008	161	158	160	160	1.1	20	19	21	24	1.7	13.5	12.7	13.5	13.3	0.3	60.7	60.7	61.5	60.5	1.1	16	15	18	18	2.1
		2007	154	152	154	154	0.9	22	20	22	25	1.2	12.6	11.9	12.7	12.3	0.3	61.4	61.7	60.6	60.9	0.5	30	29	27	31	3.2
	Mean		158	155	157	157	0.7	21	19	22	25	1.1	13.1	12.3	13.1	12.8	0.2	61.1	61.2	61.1	60.7	0.6	23	22	23	24	1.9
Ritzville		2007	158	156	157	155	1.3	21	18	20	23	2.6	13.0	12.9	13.1	12.1	0.9	56.2	57.3	56.6	56.5	1.2	19	19	19	23	4.1
Lamont		2008	178	173	178	175	1.5	25	23	25	28	1.5	12.0	11.3	11.4	11.2	0.5	59.4	59.6	58.7	58.4	0.7	25	27	27	25	4.6
		2007	168	166	168	166	1.4	30	28	30	34	1.6	11.0	10.9	10.2	10.6	0.6	61.6	61.4	60.7	58.9	1.1	43	46	44	50	5.6
	Mean		173	169	173	170	1.0	28	25	27	31	1.1	11.5	11.1	10.8	10.9	0.4	60.5	60.5	59.7	58.6	0.6	34	37	36	37	3.5
Horse Heaven		2008	157	155	157	158	1.5	22	20	22	24	1.9	13.5	13.3	12.9	13.6	0.5	60.1	60.5	60.3	59.1	1.0	28	23	24	28	4.7
		2007	149	147	148	147	0.9	23	22	23	27	1.3	12.3	12.1	12.1	12.0	0.8	62.1	62.0	61.5	61.6	1.1	28	26	30	30	3.0
	Mean		153	151	153	153	0.9	23	21	23	26	1.1	12.9	12.7	12.5	12.8	1.1	61.1	61.2	60.9	60.4	0.6	28	24	27	29	2.7
Bickleton		2008	na	na	na	na	na	29	26	27	33	2.5	10.7	10.3	10.5	10.0	0.5	61.4	61.1	59.8	58.7	0.9	38	38	37	41	6.5
		2007	na	na	na	na	na	20	20	23	23	2.9	11.1	10.5	11.3	10.5	0.7	59.2	59.1	59.1	58.7	1.6	25	25	25	33	10.1
	Mean		na	na	na	na	na	25	23	25	28	3.0	10.9	10.4	10.9	10.3	0.4	60.3	60.1	59.4	58.7	0.6	32	32	31	37	5.8
Connell		2008	157	153	155	155	0.9	20	21	21	24	1.4	14.0	13.0	13.5	13.9	0.3	59.8	61.8	60.3	58.7	0.9	18	18	18	17	4.0
		2007	151	149	150	149	0.9	23	22	23	27	1.4	13.1	12.4	13.1	12.2	0.3	61.7	62.4	61.6	61.7	1.5	26	25	26	29	2.4
	Mean		154	151	153	152	0.6	22	21	22	25	1.0	13.6	12.7	13.3	13.0	0.2	60.7	62.1	61.0	60.2	1.5	22	21	22	23	2.3
Almira		2008	179	178	180	179	1.2	28	26	29	31	1.2	10.8	10.5	11.1	11.0	0.5	61.4	61.0	60.3	59.3	1.1	61	57	57	56	4.2
		2007	180	173	178	179	2.0	29	28	31	32	1.7	12.0	11.7	11.6	12.1	0.7	60.5	59.8	59.0	56.2	1.5	44	38	43	41	5.1
	Mean		179	175	179	179	1.2	29	27	30	31	1.0	11.4	11.1	11.3	11.5	0.4	61.0	60.4	59.7	57.7	0.9	52	47	50	48	3.3
Grand Mean			163	160	162	161	0.3	24	23	25	27	0.5	12.3	11.8	12.1	11.9	0.1	60.4	60.6	60.0	59.2	0.3	31	30	30	32	1.3

Analysis Method: Analysis of Variance; na=not available.

**Table 3: Mean heading date (Julian), plant height (inches), grain protein content (%), test weight (lb/bu) and grain yield (bu/A) of WA8047 and check cultivars in the 2007 and 2008 WSU Extension Uniform Cereal Variety Testing Spring Wheat Variety Performance Trials in areas receiving 15 to 18 inches of average annual precipitation.**

Location	Precip. (in)		Heading Date					Plant Height					Grain Protein Content					Test Weight					Yield				
			WA8047	Eden	Alpowa	Louise	LSD @.10	WA8047	Eden	Alpowa	Louise	LSD @.10	WA8047	Eden	Alpowa	Louise	LSD @.10	WA8047	Eden	Alpowa	Louise	LSD @.10	WA8047	Eden	Alpowa	Louise	LSD @.10
Walla Walla	15-18	2008	164	161	164	162	1.1	30	30	31	35	1.6	12.8	11.8	12.2	11.8	0.3	61.3	61.7	61.3	59.5	0.6	41	42	42	47	5.0
		2007	164	162	164	162	1.4	30	28	27	32	1.9	11.9	11.4	11.8	11.2	0.5	61.1	62.0	61.4	61.0	0.4	46	49	42	49	2.9
		Mean	164	161	164	162	0.9	30	29	29	33	1.2	12.4	11.6	12.0	11.5	0.3	61.2	61.9	61.3	60.2	0.3	43	45	42	48	2.9
Dayton		2008	177	175	177	177	1.0	30	28	30	34	1.2	11.8	11.0	11.6	12.0	0.2	58.5	58.9	57.1	56.7	0.3	57	55	57	61	3.5
		2007	175	173	173	175	1.9	30	29	31	33	1.8	11.3	10.8	10.9	10.9	0.6	60.7	60.7	59.5	58.9	0.9	68	66	71	72	6.7
		Mean	176	174	175	176	1.1	30	29	31	34	1.1	11.6	10.9	11.2	11.4	0.2	58.5	58.9	57.1	56.7	0.3	63	61	64	67	3.7
Endicott		2008	174	173	174	174	0.9	30	28	30	34	2.8	13.5	12.5	13.0	12.3	0.6	63.2	62.6	62.5	61.5	0.8	63	54	62	66	5.8
		2007	165	162	163	163	0.8	33	30	30	35	1.1	12.2	11.3	11.4	11.8	0.2	60.5	60.3	58.8	57.3	0.6	53	52	52	52	2.3
		Mean	170	168	169	168	0.6	32	29	30	34	1.5	12.8	11.9	12.2	12.1	0.3	61.9	61.5	60.6	59.4	0.5	58	53	57	59	3.1
St. John		2008	181	179	180	180	1.7	29	28	32	32	1.5	12.3	11.5	11.3	11.2	0.8	59.3	60.1	58.6	59.5	1.2	42	60	64	56	10.4
		2007	170	169	170	169	1.7	31	29	31	34	1.4	10.9	10.6	10.3	10.3	0.5	61.7	61.5	60.3	59.8	1.1	69	68	71	74	6.4
		Mean	175	174	175	175	1.2	30	29	31	33	1.0	11.6	11.0	10.8	10.7	0.5	60.5	60.8	59.5	59.6	0.8	56	64	67	65	6.0
Reardan		2008	na	na	na	na	na	25	22	26	31	1.8	10.4	11.7	10.9	10.0	0.4	62.2	62.2	61.8	61.7	0.7	31	31	41	42	4.1
		2007	180	179	179	179	1.7	31	29	31	34	1.1	13.5	12.7	13.5	13.6	0.4	60.5	59.2	59.0	58.1	0.8	32	39	40	32	6.3
		Mean	*	*	*	*	*	28	26	29	32	1.1	12.0	12.2	12.2	11.8	0.3	61.4	60.7	60.4	59.9	0.5	32	35	41	37	3.7
Mayview		2008	186	182	185	183	1.5	25	24	25	27	1.9	10.3	10.3	10.1	10.3	0.6	62.1	61.8	62.2	60.4	0.9	56	54	54	56	3.2
		2007	184	183	183	183	1.7	30	28	31	34	1.3	11.6	10.8	11.4	11.4	1.1	60.8	60.9	60.5	59.0	0.7	56	60	56	65	4.8
		Mean	185	182	184	183	1.1	27	26	28	30	1.2	10.9	10.5	10.8	10.9	0.4	61.5	61.4	61.3	59.7	0.5	56	57	55	60	2.8
<b>Grand Mean</b>			174	172	174	173	0.4	29	28	30	33	0.5	11.9	11.4	11.5	11.4	0.1	61.0	61.0	60.2	59.4	0.2	51	52	54	56	1.6

Analysis Method: Analysis of Variance

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**Table 4:** Mean heading date (Julian), plant height (inches), grain protein content (%), test weight (lb/bu) and grain yield (bu/A) of WA8047 and check cultivars in the 2007 and 2008 WSU Extension Uniform Cereal Variety Testing Spring Wheat Variety Performance Trials receiving more than 18 inches of average annual precipitation or with irrigation.

Location	Precip. (in)		Heading Date					Plant Height					Grain Protein Content					Test Weight					Yield				
			WA8047	Eden	Alpowa	Louise	LSD @.10	WA8047	Eden	Alpowa	Louise	LSD @.10	WA8047	Eden	Alpowa	Louise	LSD @.10	WA8047	Eden	Alpowa	Louise	LSD @.10	WA8047	Eden	Alpowa	Louise	LSD @.10
Pullman	>18	2008	179	177	179	178	0.7	32	29	30	33	1.3	10.5	10.1	11.3	10.7	0.8	61.9	60.9	59.4	59.5	1.0	69	69	71	69	3.7
		2007	169	166	169	169	1.4	38	34	35	38	1.3	12.1	11.3	11.5	11.7	0.9	62.5	61.9	60.8	60.6	1.1	82	88	85	91	7.8
	Mean		174	171	179	178	0.7	35	32	33	35	0.9	11.3	10.1	11.3	10.7	0.8	62.2	61.4	60.1	60.0	0.7	76	78	78	80	4.2
Fairfield		2007	180	178	180	178	1.4	31	28	31	34	1.8	9.2	9.7	9.2	8.8	0.5	59.9	60.9	61.1	60.7	0.6	59	58	59	64	4.8
Farmington		2008	186	182	186	184	0.9	29	28	24	33	2.5	11.1	10.6	10.9	10.8	0.5	60.4	59.1	59.9	58.6	1.0	59	65	59	60	5.8
		2007	177	177	180	177	1.4	40	36	38	40	2.2	11.8	11.2	11.6	11.4	0.6	60.9	61.5	59.8	59.0	0.7	100	97	100	101	10.4
	Mean		181	179	183	180	0.8	35	32	31	37	1.7	11.4	10.9	11.3	11.1	0.4	60.7	60.3	59.8	58.8	0.6	79	81	80	81	4.1
Grand Mean			178	176	179	177	0.5	34	31	32	35	0.8	10.9	10.6	10.9	10.7	0.3	61.1	60.9	60.4	59.7	0.4	74	75	75	77	2.5
Moses Lake	Irr	2008	158	156	158	156	2.2	37	30	32	35	2.6	13.8	12.9	13.0	14.0	1.1	59.2	59.9	59.6	58.5	2.4	81	88	104	72	23.1
		2007	155	154	157	154	1.3	41	38	40	38	2.7	11.8	11.0	10.5	10.5	0.6	60.4	59.9	60.7	60.1	1.3	101	105	129	114	7.8
	Mean		157	155	157	155	1.2	39	34	36	36	1.9	12.8	11.9	11.7	12.2	0.6	59.8	59.9	60.1	58.3	1.0	91	96	116	93	10.3
Overall Mean			170	167	169	168	0.2	29	27	28	31	0.3	12.0	11.5	11.7	11.5	0.1	60.7	60.8	60.1	59.3	0.2	49	49	52	52	1.1

Analysis Method: Analysis of Variance

**Table 5:** 2005 stripe rust infection type (IT) and severity (%) on WA8047 and check lines at Whitlow Farm and Mt. Vernon, WA when recorded at the indicated dates and stages of plant growth under natural infection.

ID	CLASS	Stripe Rust*		
		Whitlow	Mt. Vernon	
		7/1/05	5/25/05	6/29/05
		Headed	Tillering	Flowering
		IT %	IT %	IT %
<b>LEMHI (S check)</b>		<b>8 100</b>	<b>8 30</b>	<b>8 100</b>
Alpowa	SWS	2 10	0 0	2 20
Eden	SWC	8 50	0 0	2 10
Scarlet	HRS	8 70	8 20	8 60
WA8047	SWC	3 5	0 0	2 1

\* Infection Type (IT) was recorded based on the 0-9 scale with ITs 8 and 9 combined as 8 (the most susceptible reaction) in field data. Generally IT 0-3 are considered resistant, 4-6 intermediate, and 7-9 susceptible.

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**Table 6:** 2007 stripe rust infection type (IT) and severity (%) on WA8047 and check lines at Spillman Farm, Plant Path Farm, Whitlow Farm, Mt. Vernon, Walla Walla, and Lind when recorded at the indicated dates and stages of plant growth under natural infection.

ID	CLASS	Stripe Rust*						
		Spillman	Plant Path	Whitlow	Mt. Vernon		Walla Walla	Lind
		7/20/07	7/12/07	7/11/07	5/31/07	7/9/07	6/22/07	6/14/07
		Milk	Flowering	Flowering	Tillering	Milk	Milk	Flowering
		IT %	IT %	IT %	IT %	IT %	IT %	
<b>LEMHI (S check)</b>		<b>8 60</b>	<b>8 50</b>	<b>8 80</b>	<b>8 20</b>	<b>8 80</b>	<b>8 20</b>	<b>8 30</b>
Alpowa	SWS	2 20	2 10	2 20	8 10	2-3 30	3 5	2 2
Eden	SWC	5 30	5 30	8 40	8 10	8 60	5 5	8 10
Scarlet	HRS	8 30	8 20	8 40	5 5	8 60	8 5	8 10
WA8047	SWC	2 10	2 1	3 10	5 5	3 30	0 0	0 0

\* Infection Type (IT) was recorded based on the 0-9 scale with ITs 8 and 9 combined as 8 (the most susceptible reaction) in field data. Generally IT 0-3 are considered resistant, 4-6 intermediate, and 7-9 susceptible.

**Table 7:** 2008 stripe rust infection type (IT) and severity (%) on WA8047 and check lines at Spillman Farm, Plant Path Farm, Whitlow Farm, Mt. Vernon, Walla Walla, and Lind when recorded at the indicated dates and stages of plant growth under natural infection.

ID	CLASS	Stripe Rust*						
		Spillman	Plant Path	Whitlow	Mt. Vernon		Walla Walla	Lind
		7/23/2008	7/22/2008	7/15/2008	6/4/2008	7/8/2008	7/1/2008	7/3/2008
		Dough	Milk	Early milk	Stem elong.	L. flowering	Milk	Milk
IT %	IT %	IT %	IT %	IT %	IT %	IT %		
<b>Lemhi (S check)</b>		<b>8 80</b>	<b>8 80</b>	<b>8 90</b>	<b>8 60</b>	<b>8 100</b>	<b>8 5</b>	<b>0 0</b>
Alpowa	SWS	3 20	2 30	2 20	8 20	2 10	1 5	0 0
Eden	SWC	2 5	2 1	8 5	8 10	8 10	1 5	0 0
WA8047	SWC	2 1	2 10	2 1	1 5	3 10	3 5	0 0

\* Infection Type (IT) was recorded based on the 0-9 scale with ITs 8 and 9 combined as 8 (the most susceptible reaction) in field data. Generally IT 0-3 are considered resistant, 4-6 intermediate, and 7-9 susceptible.

**Table 8:** 2008 stripe rust infection type (IT) and severity (%) on WA8047 and check lines at Spillman Farm, Plant Path Farm, Whitlow Farm, Mt. Vernon, Walla Walla, and Lind when recorded at the indicated dates and stages of plant growth under natural infection.

ID	CLASS	Stripe Rust*						
		Spillman	Plant Path	Whitlow	Mt. Vernon		Walla Walla	Lind
		7/23/2008	7/22/2008	7/15/2008	6/4/2008	7/8/2008	7/1/2008	7/3/2008
		Dough	Milk	Early milk	Stem elong.	L. flowering	Milk	Milk
IT %	IT %	IT %	IT %	IT %	IT %	IT %		
<b>Lemhi (S check)</b>		<b>8 90</b>	<b>8 70</b>	<b>8 80</b>	<b>8 30</b>	<b>8 100</b>	<b>8 40</b>	<b>0 0</b>
Alpowa	SWS	2 30	2 10	2 30	8 2	3 20	3 20	0 0
Louise	SWC	2 1	2 1	2 20	8 1	3 10	3 5	0 0
WA8047	SWC	2 1	2 1	3 10	8 1	3 1	5 10	0 0

\* Infection Type (IT) was recorded based on the 0-9 scale with ITs 8 and 9 combined as 8 (the most susceptible reaction) in field data. Generally IT 0-3 are considered resistant, 4-6 intermediate, and 7-9 susceptible.

**Table 9:** 2008 stripe rust infection type (IT) and severity (%) on WA8047 and check lines at Spillman Farm and Mt. Vernon when recorded at the indicated dates and stages of plant growth under natural infection.

ID	CLASS	Stripe Rust*		
		Pullman	Mt. Vernon	
		7/16/08	6/4/08	7/7/08
		Milk	Stem elong.	L. flowering
		IT %	IT %	IT %
<b>Lemhi (S Check)</b>		<b>8 100</b>	<b>8 40</b>	<b>8 100</b>
Eden	SWC	8 30	8 10	5 60
Calorwa	SWC	8 60	8 10	5 60
Louise	SWS	3 5	8 5	1 5
WA8047	SWC	5 10	0 0	3 5
<b>Lemhi (S Check)</b>		<b>8 100</b>	<b>8 60</b>	<b>9 100</b>
WA8047	SWC	5 10	8 5	5 10
Eden	SWC	8 20	8 5	8 60
Calorwa	SWC	8 80	1 5	7 30
Louise	SWS	3 5	1 5	5 30
Calorwa	SWC	- -	1 10	5 60
Eden	SWC	- -	1 5	3 20
WA8047	SWC	- -	0 0	3 20
Louise	SWS	3 5	1 1	3 20
<b>Lemhi (S Check)</b>		<b>8 100</b>	<b>8 80</b>	<b>9 100</b>

\* Infection Type (IT) was recorded based on the 0-9 scale with ITs 8 and 9 combined as 8 (the most susceptible reaction) in field data. Generally IT 0-3 are considered resistant, 4-6 intermediate, and 7-9 susceptible.

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**Table 10:** Infection types on WA8047 and check lines produced by races of *Puccinia striiformis f. sp. tritici* in the seedling stage under controlled greenhouse conditions in 2007 (diurnal temperature changing from 4 to 20C).

		2007	
		PL 11/30/07	PL 12/12
		Inoc 12/12/07	Inoc 12/26
		Rd 12/31/07	Rd 1/14
ID	CLASS	PST-116	PST-45
Lemhi (S check)		8	8
Alpowa	SWS	8	7
Eden	SWC	8	2
Scarlet	HRS	8	8
WA8047	SWC	3	2

\* Infection Type (IT) was recorded based on the 0-9 scale with ITs 8 and 9 combined as 8 (the most susceptible reaction) in data. Generally IT 0-3 are considered resistant, 4-6 intermediate, and 7-9 susceptible.

**Table 11:** Infection types on WA8047 and check lines produced by races of *Puccinia striiformis f. sp. tritici* in the adult-plant stage under controlled greenhouse conditions in 2007 (diurnal temperature cycle gradually changing from 10 to 20C).

ID	Infection type and (number of adult-plants) tested under high-temperatures							
	PST-45		PST-100			PST-116		
	Rep 1	Rep 2	Rep1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3
Lemhi (S check)	7 (3)	8 (3)	8 (3)	8 (3)	8 (3)	8 (3)	8 (3)	8 (3)
Alpowa	3 (3)	3 (1)	3 (2)	3-4 (2)	3-4 (3)	3 (3)	3 (3)	ND
WA8047	0 (4)	0 (3)	0 (3)	0 (3)	0 (2)	0 (3)	3 (3)	ND

\* Infection Type (IT) was recorded based on the 0-9 scale with ITs 8 and 9 combined as 8 (the most susceptible reaction) in data. Generally IT 0-3 are considered resistant, 4-6 intermediate, and 7-9 susceptible. \*\* No data

**Table 12:** Infection types on WA8047 and check line (Lemhi) produced by races of *Puccinia striiformis f. sp. tritici* in the seedling and adult stage under controlled greenhouse conditions in 2008.

			Seedling						Adult		
		Planting	11/30/07	12/12/07	1/1/08	1/16/08	1/24/08	2/20/08	12/27/07	12/27/08	12/27/08
		Inoculation	12/12/07	12/26/07	1/14/08	1/28/08	2/4/08	3/30/08	2/6/08	2/8/08	2/5/08
		Reading	12/31/07	1/14/08	1/30/08	2/14/08	2/20/08	3/20/08	2/25/08	2/26/08	2/25/08
ID	CLASS	Race	PST-116	PST-45	PST-100	PST-17	PST-37	PST-127	PST-116	PST-100	PST-127
Lemhi (S check)		IT	8	8	8	8	8	8	8,8,8	8,8	8,8,8
WA8047	SWS	IT	3,8	2	2	2	3	2	2,2,1	1,1,1,	0,1,0

\* Infection Type (IT) was recorded based on the 0-9 scale with ITs 8 and 9 combined as 8 (the most susceptible reaction) in data. Generally IT 0-3 are considered resistant, 4-6 intermediate, and 7-9 susceptible.

Table 13: Nursery Sources for WA8047 Data Set

Year	Nursery	Nursery Name	Location	Breeder Name
2004	49	SINGLE PLOT CLUB	PULLMAN	K.K. KIDWELL
2005	51	LIND PRELIMINARY CLUB	LIND	K.K. KIDWELL
2006	56	STATE CLUB	DUSTY	K.K. KIDWELL
2006	57	STATE CLUB	PULLMAN	K.K. KIDWELL
2007	13	G&E SOFT SPRING	ST JOHN	C.F. MORRIS
2007	48	TRISTATE SOFT	PULLMAN	K.K. KIDWELL
2007	1013	G&E SOFT SPRING	DAYTON	C.F. MORRIS
2007	3013	G&E SOFT SPRING	LAMONT	C.F. MORRIS
2007	4013	G&E SOFT SPRING	LIND	C.F. MORRIS
2007	5013	G&E SOFT SPRING	MOSES LAKE	C.F. MORRIS
2007	1042	G&E VARIETY RELEASE SWS	ALMIRA	K.K. KIDWELL
2007	2042	G&E VARIETY RELEASE SWS	BICKLETON	K.K. KIDWELL
2007	3042	G&E VARIETY RELEASE SWS	CONNELL	K.K. KIDWELL
2007	4042	G&E VARIETY RELEASE SWS	ENDICOTT	K.K. KIDWELL
2007	5042	G&E VARIETY RELEASE SWS	FAIRFIELD	K.K. KIDWELL
2007	6042	G&E VARIETY RELEASE SWS	FARMINGTON	K.K. KIDWELL
2007	7042	G&E VARIETY RELEASE SWS	HORSE HEAVEN	K.K. KIDWELL
2007	8042	G&E VARIETY RELEASE SWS	MAYVIEW	K.K. KIDWELL
2007	9042	G&E VARIETY RELEASE SWS	PULLMAN	K.K. KIDWELL
2008	8	WESTERN REGIONAL SOFT SPRING	COMPOSITE	C.F. MORRIS
2008	11	PNW WHEAT QUALITY COUNCIL	PULLMAN	C.F. MORRIS
2008	39	TRISTATE SOFT	PULLMAN	K.K. KIDWELL
2008	45	STATE CLUB PULLMAN	PULLMAN	K.K. KIDWELL
2008	46	STATE CLUB LIND	LIND	K.K. KIDWELL
2008	52	PRELIM CLUB	PULLMAN	K.K. KIDWELL
2008	62	CLUB SINGLE PLOT	PULLMAN	K.K. KIDWELL
2008	6013	G&E SOFT SPRING	BICKLETON	C.F. MORRIS
2008	7013	G&E SOFT SPRING	WALLA WALLA	C.F. MORRIS
2008	8013	G&E SOFT SPRING	REARDAN	C.F. MORRIS
2008	9013	G&E SOFT SPRING	HORSE HEAVEN	C.F. MORRIS
2008	10013	G&E SOFT SPRING	ALMIRA	C.F. MORRIS
2008	10042	WESTERN REG SOFT	PULLMAN	K.K. KIDWELL
2008	1056	G&E EXTRA SOFT SPRING	PULLMAN	K.K. KIDWELL
2008	2056	G&E EXTRA SOFT SPRING	ENDICOTT	K.K. KIDWELL
2008	3056	G&E EXTRA SOFT SPRING	FARMINGTON	K.K. KIDWELL

\* Nurseries 13, 42 and 56 were assigned new nursery numbers by location to give each location a unique nursery identification for statistical purposes.



Table 14. Data Pair by Nursery Number Detail

Year	2004				2005				2006				2007							
Variety																				
ALPOWA	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
ALTURAS	0	0	0	0	1	1	0	0	1	0	1	0	1	0	0	0	0	0	0	1
EDEN	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
LOUISE	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
ZAK	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WA8047	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Year	2008																			
Variety																				
ALPOWA	1	0	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0
ALTURAS	1	1	1	1	1	1	1	1	1	0	0	0	1	1	1	1	0	0	0	0
EDEN	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1
LOUISE	1	0	1	1	1	1	1	1	1	0	0	0	1	1	1	1	1	1	1	1
ZAK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WA8047	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

\* 1 indicates data pair present in analysis  
 \* 0 indicates data pair not present in analysis

Table 15: Analysis of Variance Balanced Paired t Test Design

Variety	Test	p-Value	LSD	High Variety	Mean	Low Variety	Mean	Significance	Data Pairs
ALPOWA	WVT	0.00	0.73	WA8047	52.8	ALPOWA	51.8	SIGNIFICANT	20
ALTURAS	WVT	0.00	0.73	WA8047	52.8	ALTURAS	51.7	SIGNIFICANT	17
EDEN	WVT	0.00	0.73	WA8047	52.8	EDEN	52.0	NON	33
LOUISE	WVT	0.00	0.73	WA8047	52.8	LOUISE	50.9	SIGNIFICANT	27
ALPOWA	WPROT	0.83	0.39	ALPOWA	11.4	WA8047	11.3	NON	20
ALTURAS	WPROT	0.09	0.32	WA8047	11.2	ALTURAS	10.9	NON	17
EDEN	WPROT	0.00	0.41	WA8047	11.3	EDEN	10.7	SIGNIFICANT	32
LOUISE	WPROT	0.07	0.38	WA8047	11.1	LOUISE	10.8	NON	27
ALPOWA	SKHRD	0.00	0.85	ALPOWA	32.8	ALPOWA	32.7	SIGNIFICANT	19
ALTURAS	SKHRD	0.00	0.85	ALTURAS	30.9	ALTURAS	30.0	NON	16
EDEN	SKHRD	0.00	0.85	EDEN	30.4	EDEN	28.3	SIGNIFICANT	33
LOUISE	SKHRD	0.00	0.85	LOUISE	37.6	LOUISE	30.7	SIGNIFICANT	26
ALPOWA	SKWWT	0.05	1.69	ALPOWA	32.8	WA8047	31.1	SIGNIFICANT	19
ALTURAS	SKWWT	0.35	1.06	ALTURAS	30.9	WA8047	30.4	NON	16
EDEN	SKWWT	0.00	1.04	WA8047	30.4	EDEN	28.3	SIGNIFICANT	33
LOUISE	SKWWT	0.00	1.68	LOUISE	37.6	WA8047	30.7	SIGNIFICANT	26
ALPOWA	SKWASD	0.00	0.85	ALPOWA	70.9	ALPOWA	67.1	SIGNIFICANT	20
ALTURAS	SKWASD	0.01	0.80	ALTURAS	70.6	ALTURAS	70.2	NON	17
EDEN	SKWASD	0.00	0.85	WA8047	71.0	EDEN	69.9	SIGNIFICANT	32
LOUISE	SKWASD	0.00	0.85	WA8047	70.9	LOUISE	69.6	SIGNIFICANT	27
ALPOWA	FYIELD	0.00	0.73	WA8047	70.9	ALPOWA	67.1	SIGNIFICANT	20
ALTURAS	FYIELD	0.14	0.57	WA8047	70.6	ALTURAS	70.2	NON	17
EDEN	FYIELD	0.00	0.45	WA8047	71.0	EDEN	69.9	SIGNIFICANT	32
LOUISE	FYIELD	0.00	0.48	WA8047	70.9	LOUISE	69.6	SIGNIFICANT	27
ALPOWA	SKFYIELD	0.00	0.73	WA8047	49.4	ALPOWA	49.2	SIGNIFICANT	20
ALTURAS	SKFYIELD	0.00	0.73	ALTURAS	49.4	ALTURAS	49.1	NON	17
EDEN	SKFYIELD	0.00	0.43	EDEN	50.2	WA8047	50.1	NON	31
LOUISE	SKFYIELD	0.00	0.68	WA8047	49.2	LOUISE	49.1	NON	27
ALPOWA	FASH	0.05	0.01	ALPOWA	0.37	WA8047	0.36	SIGNIFICANT	20
ALTURAS	FASH	0.00	0.01	ALTURAS	0.39	WA8047	0.35	SIGNIFICANT	17
EDEN	FASH	0.32	0.01	EDEN	0.35	WA8047	0.35	NON	33
LOUISE	FASH	0.04	0.01	LOUISE	0.36	WA8047	0.35	SIGNIFICANT	27
ALPOWA	MSCOR	0.00	0.30	WA8047	38.0	ALPOWA	37.0	SIGNIFICANT	20
ALTURAS	MSCOR	0.00	0.30	WA8047	38.0	ALTURAS	36.3	SIGNIFICANT	17
EDEN	MSCOR	0.00	0.05	WA8047	38.0	EDEN	37.2	SIGNIFICANT	31
LOUISE	MSCOR	0.00	0.30	WA8047	38.0	LOUISE	37.2	SIGNIFICANT	27
ALPOWA	FPROT	0.38	0.34	ALPOWA	9.78	WA8047	9.64	NON	20
ALTURAS	FPROT	0.60	0.40	WA8047	9.42	ALTURAS	9.32	NON	17
EDEN	FPROT	0.01	0.35	WA8047	9.52	EDEN	9.01	SIGNIFICANT	33
LOUISE	FPROT	0.20	0.35	WA8047	9.39	LOUISE	9.17	NON	27
EDEN	MSC	0.00	0.52	EDEN	20.9	WA8047	19.6	NON	32
ALPOWA	FSV	0.00	0.60	ALPOWA	20.9	WA8047	19.6	SIGNIFICANT	19
ALTURAS	FSV	0.00	1.05	ALTURAS	24.1	WA8047	19.9	SIGNIFICANT	15
LOUISE	FSV	0.07	0.63	WA8047	19.7	LOUISE	19.1	NON	24
ALPOWA	MABS	0.00	0.72	ALPOWA	55.0	WA8047	50.7	SIGNIFICANT	19
ALTURAS	MABS	0.00	0.72	ALTURAS	55.0	WA8047	51.7	SIGNIFICANT	16
EDEN	MABS	0.00	0.63	EDEN	56.3	WA8047	51.0	SIGNIFICANT	33
LOUISE	MABS	0.00	0.63	LOUISE	55.3	WA8047	51.0	SIGNIFICANT	27
ALPOWA	CODI	0.00	0.12	WA8047	9.70	ALPOWA	9.08	SIGNIFICANT	19
ALTURAS	CODI	0.00	0.11	WA8047	9.59	ALTURAS	9.33	SIGNIFICANT	16
EDEN	CODI	0.00	0.06	WA8047	9.66	EDEN	9.53	SIGNIFICANT	32
LOUISE	CODI	0.00	0.08	WA8047	9.67	LOUISE	9.51	SIGNIFICANT	25
EDEN	CAVCI	0.00	0.50	EDEN	2.24	EDEN	2.24	NON	20
ALPOWA	LDOPA	0.00	0.08	ALPOWA	1.18	WA8047	0.74	SIGNIFICANT	14
ALTURAS	LDOPA	0.00	0.12	WA8047	0.77	ALTURAS	0.42	SIGNIFICANT	5
EDEN	LDOPA	0.26	0.07	WA8047	0.76	EDEN	0.72	NON	15
LOUISE	LDOPA	0.00	0.07	LOUISE	1.05	WA8047	0.74	SIGNIFICANT	14

Table 16: Data set for WA8047

Obs	YEAR	NURSCO	LABNUM	VAR	LOCATION	TWT	SKHRD	SKWT	SKWTSD	WPROT	FYELD	MSCOR	FASH	FPROT	VISC	FSV	RVA	MABS	CAVOL	CODI		
1	2004	49	490003	EDEN	PULLMAN	63.3	28.1	31.5	7.6	9	69.2	88.2	0.33	8.1	39	.	.	.	.	9.7		
2	2004	49	490005	WA8047	PULLMAN	64.1	24	35.9	6.5	9.5	70.1	91.3	0.3	8	37	.	.	.	.	9.66		
3	2004	49	490009	ZAK	PULLMAN	60.8	16.7	30.6	8.8	9.2	68.9	85.9	0.36	7.5	44	.	.	.	.	9.98		
4	2005	51	510001	EDEN	LIND	62.9	49.1	25.7	8	12.9	69.2	86.3	0.36	11.7	134	.	.	.	.	9.21		
5	2005	51	510004	WA8047	LIND	61.6	38.2	26.6	6.4	16.2	68.5	84.8	0.37	14.4	115	.	.	.	.	9.16		
6	2006	56	560001	EDEN	DUSTY	62.5	41.8	28.6	5.8	10.3	71.6	88.7	0.37	7.9	55	.	.	.	1230	9.69		
7	2006	56	560004	WA8047	DUSTY	62.7	52.6	28.3	6.4	11.6	72.5	88.6	0.39	9.5	59	.	.	.	1210	9.75		
8	2006	57	570001	EDEN	PULLMAN	62.8	39	27.2	5.6	10.5	70.7	88.9	0.35	9.4	54	.	.	.	1310	9.32		
9	2006	57	570004	WA8047	PULLMAN	62.6	42.8	26.5	6.6	11.6	71.4	90.4	0.34	9.9	54	.	.	.	1305	9.77		
10	2007	13	130065	ALPOWA	PULLMAN	58.2	27.44	25.5	6.24	11.4	63.8	78.8	0.37	9.4	20.1	.	.	55.1	.	9.11		
11	2007	13	130066	ALTURAS	ST JOHN	61.1	21.07	29.4	7.04	10.1	70.1	86.8	0.37	7.8	24	.	.	52.8	.	9.8		
12	2007	13	130067	LOUISE	ST JOHN	60.1	24.05	32.2	7.68	9.2	68.8	87.1	0.34	7.5	19.8	.	.	52.6	.	9.91		
13	2007	13	130068	EDEN	ST JOHN	63.3	43.34	26.6	6	9.7	.	.	0.28	7.3	101	21	.	53.1	.	1385	9.94	
14	2007	13	130079	WA8047	ST JOHN	62.9	42.08	28.4	6.13	10.3	71.3	90.9	0.33	9	64	20.7	.	49.2	.	1315	9.86	
15	2007	48	480002	EDEN	PULLMAN	63.6	41	26.6	5.9	11.3	70.5	91.8	0.3	8.5	79	.	.	.	.	1235	9.65	
16	2007	48	480003	WA8047	PULLMAN	64.1	41.3	30.2	5.9	11.5	71.8	93.4	0.3	8.9	71	.	.	.	.	1250	9.94	
17	2007	48	480006	ALTURAS	PULLMAN	62.3	26.1	31.1	6.8	9.9	72.1	90.6	0.35	9	125	23.4	.	.	.	1150	9.74	
18	2007	48	480007	LOUISE	PULLMAN	62.3	30.2	36.1	9.1	9.9	70.8	90.9	0.32	8.2	134	19.2	.	.	.	1280	9.8	
19	2007	1013	130001	ALPOWA	DAYTON	60.5	14.63	31.1	7.13	11	68.9	84.6	0.38	9	22.5	.	.	56.6	.	9.39		
20	2007	1013	130002	ALTURAS	DAYTON	61.1	13.25	30.7	6.76	10.5	73	87.3	0.42	8.9	24.6	.	.	55.7	.	9.69		
21	2007	1013	130003	LOUISE	DAYTON	60.7	11.84	38.7	7.53	10.9	71.8	88.3	0.38	9	20.4	.	.	53.7	.	9.79		
22	2007	1013	130004	EDEN	DAYTON	61.7	27.38	27.2	6.58	10.4	71.4	89.7	0.35	8.5	67	19.5	.	52	.	1230	9.64	
23	2007	1013	130015	WA8047	DAYTON	62.4	19.31	33	6.51	11.1	73.4	92.3	0.35	9.1	54	20.7	.	50.3	.	1300	9.69	
24	2007	1042	420004	LOUISE	ALMIRA	60.4	23.4	37	8.7	9.8	70.9	87.2	0.38	8.6	20.4	.	.	53.8	.	9.91		
25	2007	1042	420005	ALPOWA	ALMIRA	60.7	29.1	26.6	7.4	10.7	66.3	80.7	0.39	9.4	22.2	.	.	55.8	.	8.86		
26	2007	1042	420006	WA8047	ALMIRA	61.9	36.2	27	6.6	11.7	71.8	87.7	0.39	10.1	68	19.5	.	50.7	.	1240	9.79	
27	2007	1042	420007	EDEN	ALMIRA	61.9	41	25.6	5.9	11.1	69.9	85.9	0.38	9.7	89	19.2	.	52.3	.	1210	9.91	
28	2007	2042	420011	LOUISE	BICKLETON	62.2	19.9	40.5	8.7	9.8	71.1	86.8	0.39	8.1	20.1	.	.	54.6	.	9.86		
29	2007	2042	420012	ALPOWA	BICKLETON	61.6	16.3	30.7	7	11.6	67.6	81.7	0.4	10.2	21.3	.	.	55.3	.	9.07		
30	2007	2042	420013	WA8047	BICKLETON	61.6	25.8	27.9	7	11.3	72.1	84.9	0.44	9.8	71	19.8	.	46.6	.	1225	9.82	
31	2007	2042	420014	EDEN	BICKLETON	62.7	27.2	30	6.2	9.8	71.5	84.8	0.43	8.1	52	18.9	.	46.6	.	1260	9.84	
32	2007	3013	130017	ALPOWA	LAMONT	63.3	27.78	35.5	7.1	9.7	69.6	88.1	0.34	8.2	21.3	.	.	50.4	.	9.4		
33	2007	3013	130018	ALTURAS	LAMONT	61.8	25.83	31.3	7.12	10.2	70.5	87.3	0.37	8.9	25.2	.	.	53.3	.	9.61		
34	2007	3013	130019	LOUISE	LAMONT	59.9	27.11	34.7	9.99	10	68.3	84.5	0.37	8.6	17.6	.	.	52.8	.	9.41		
35	2007	3013	130020	EDEN	LAMONT	61.5	36.13	28.3	6.57	9.4	67.4	84.6	0.35	7.7	53	17.3	.	51.8	.	1275	9.71	
36	2007	3013	130031	WA8047	LAMONT	63.6	45.16	29.7	6.02	10.2	70.8	90.3	0.33	8.8	57	19.8	.	51.6	.	1290	9.73	
37	2007	3042	420018	LOUISE	CONNELL	63.2	14.3	41.4	11.3	12.4	71.3	89.6	0.35	10.8	18.2	.	.	56.1	.	9.36		
38	2007	3042	420019	ALPOWA	CONNELL	63.1	23.4	38.1	8.1	12.8	69.1	84.3	0.39	11.1	19.5	.	.	59.3	.	9.15		
39	2007	3042	420020	WA8047	CONNELL	63.5	21.8	36	7.5	13.2	70.8	89	0.35	11.5	71	19.2	.	50.8	.	1150	9.75	
40	2007	3042	420021	EDEN	CONNELL	63.7	33.6	32.6	6.9	12.6	71	86.7	0.39	11.2	101	17.6	.	51.3	.	1150	9.52	
41	2007	4013	130033	ALPOWA	LIND	62.4	24.05	37.3	7.15	14.5	68.5	82.9	0.4	11.9	20.4	.	.	56.4	.	8.76	9.24	
42	2007	4013	130034	ALTURAS	LIND	62.7	27.98	33.3	7.3	12.3	73.5	88.6	0.41	10.9	24.6	.	.	55.9	.	9.43	9.43	
43	2007	4013	130035	LOUISE	LIND	62.9	20.98	42.4	9.07	12.6	71	89.2	0.35	10.7	19.2	.	.	54.6	.	52.2	1220	9.74
44	2007	4013	130036	EDEN	LIND	63.3	36.42	30.2	6.35	11.8	70.9	88.5	0.36	10.1	80	18.2	.	52.2	.	1220	9.74	
45	2007	4013	130047	WA8047	LIND	63.2	32.03	31.7	7.6	13	72	89.9	0.36	10.8	68	18.6	.	49.1	.	1205	9.71	

Table 16: Data set for WA8047

Obs	YEAR	NURSCO	LABNUM	VAR	LOCATION	TWT	SKHRD	SKWT	SKWTSD	WPROT	FYELD	MSCOR	FASH	FPROT	VISC	FSV	RVA	MABS	CAVOL	CODI
46	2007	4042	420025	LOUISE	ENDICOTT	58.2	23.4	31.7	7.7	11.2	68.1	85.5	0.35	9.7		16.7		55.5		9.71
47	2007	4042	420026	ALPOWA	ENDICOTT	59.7	26.3	29.3	6.9	11.3	66.5	84.8	0.33	9.8		18.9		53.4		9.15
48	2007	4042	420027	WA8047	ENDICOTT	61.8	44.2	26.1	5.7	11.1	69.8	89.6	0.32	9.6	80	18.2		48	1190	9.73
49	2007	4042	420028	EDEN	ENDICOTT	61.8	42.6	26.3	6.5	10.6	73	88	0.41	9.7	62	16.7		49.2	1255	9.5
50	2007	5013	130049	ALPOWA	MOSES LAKE	62	25.52	39.6	9.84	10.8	69.3	81.3	0.44	8.4		20.7		52.5		9.35
51	2007	5013	130050	ALTURAS	MOSES LAKE	61	27.26	37	8.6	11.1	69.6	81.1	0.45	9.1		22.5		53.5		9.76
52	2007	5013	130051	LOUISE	MOSES LAKE	62	21.46	45.5	12.4	11.2	70.8	85.2	0.41	9.1		17.9		53		9.66
53	2007	5013	130052	EDEN	MOSES LAKE	61.5	21.86	34.9	8.11	9.3	70.5	86.1	0.39	7.2	35	20.1		53.7	1265	9.69
54	2007	5013	130063	WA8047	MOSES LAKE	62.3	33.73	35.1	10.4	12.5	71.2	83.8	0.44	9.7	68	18.6		51.1	1265	9.61
55	2007	5042	420032	LOUISE	FAIRFIELD	62.3	13.1	42	8.8	8.4	71.1	88.7	0.36	7		21		52.7		9.94
56	2007	5042	420033	ALPOWA	FAIRFIELD	62.7	14.7	36.5	7.2	8.8	65.4	82.7	0.34	7.7		21.6		53.7		9.56
57	2007	5042	420034	WA8047	FAIRFIELD	63	22.1	33.8	6.1	8.4	70.3	90.3	0.32	7	39	20.4		50.3	1325	9.96
58	2007	5042	420035	EDEN	FAIRFIELD	62.9	23.1	31.4	6.8	8.6	68.4	87.2	0.33	7.3	45	20.7		53.1	1285	9.84
59	2007	6042	420039	LOUISE	FARMINGTON	59.6	24.6	34.8	8.8	11	69.7	86.3	0.37	9.6		18.2		56.6		9.74
60	2007	6042	420040	ALPOWA	FARMINGTON	62.4	20.5	34.4	7.9	10.2	70.3	87.1	0.37	8.5		20.4		55.5		9.51
61	2007	6042	420041	WA8047	FARMINGTON	59.6	20.6	42.4	10.6	10	72.4	86.6	0.42	8.8	86	18.9		51	1210	9.63
62	2007	6042	420042	EDEN	FARMINGTON	63.1	35	28.8	6.4	10.6	70.9	88.5	0.36	9.3	95	17.6		52	1230	9.5
63	2007	7042	420046	LOUISE	HORSE HEAVEN	62.8	24.4	44	11	12	70.3	85.8	0.39	10.2		17.6		56.4		9.56
64	2007	7042	420047	ALPOWA	HORSE HEAVEN	63.3	27.9	38.8	8.9	11.9	67.3	81.3	0.4	10.6		18.9		57.1		9.38
65	2007	7042	420048	WA8047	HORSE HEAVEN	63.2	32	33.1	9.4	11.3	71.2	87.6	0.38	9.7	58	18.6		50.7	1210	9.9
66	2007	7042	420049	EDEN	HORSE HEAVEN	64	36	32.6	8	12.3	70.2	85	0.4	10.7	91	17.9		52.9	1140	9.69
67	2007	8042	420053	LOUISE	MAYVIEW	61	22.7	34.6	8.4	10.3	70.8	92.2	0.3	8.9		21.3		54.7		9.71
68	2007	8042	420054	ALPOWA	MAYVIEW	60.6	28.2	28.4	6.5	11.6	67.3	84.5	0.35	10.2		21.3		56.4		9.05
69	2007	8042	420055	WA8047	MAYVIEW	62.6	35.7	26.6	5.8	10.9	71.7	93.3	0.3	9.2	65	20.1		50	1225	9.91
70	2007	8042	420056	EDEN	MAYVIEW	63	33.3	27.7	5.2	10	71	93.1	0.29	8.5	62	21.3		52	1195	9.77
71	2007	9042	420060	LOUISE	PULLMAN	62.4	29.4	38	9.3	11.6	70.8	89.6	0.34	9.5		18.9		55.1		9.68
72	2007	9042	420061	ALPOWA	PULLMAN	61.2	27.4	29	7.4	11.1	67.4	84.6	0.35	9.7		20.1		55.4		9.2
73	2007	9042	420062	WA8047	PULLMAN	63.8	43.4	30.5	6.3	11.6	70.9	91.7	0.31	9.8	86	19.2		50.7	1200	9.74
74	2007	9042	420063	EDEN	PULLMAN	63.5	39.5	28.9	6.4	10.4	70.9	89.1	0.35	9	80	18.6		52.2	1250	9.69
75	2008	8	80001	ALPOWA	COMPOSITE	61.3				12.8	63.6	81.7	0.32	10.6						
76	2008	8	80002	ALTURAS	COMPOSITE	59.2				12.5	68.9	85.9	0.36	11.3						
77	2008	8	80003	LOUISE	COMPOSITE	57.4				13.7	65.7	79.3	0.4	11.7						
78	2008	8	80007	WA8047	COMPOSITE	60.8				12.2	69	86.1	0.36	10.2						
79	2008	11	110014	WA8047	PULLMAN	62.2	19.6	30.1	5.7		77		0.37	8.3	41	20.8	120	51.2	1275	9.54
80	2008	11	110015	EDEN	PULLMAN	62.4	32.1	26.9	6.3		75.7		0.38	7.4	40	21.3	130	52.7	1255	9.48
81	2008	11	110029	ALTURAS	ABERDEEN	62.4	11.3	37.6	9.3		79.2		0.5	9.1	62	24.9	186	57.9	1180	9.05
82	2008	39	390001	EDEN	PULLMAN	62.3	34	27.5	5.5	8.8	67.8	88.3	0.3	7.5	46	19.2			1145	9.56
83	2008	39	390002	WA8047	PULLMAN	63.4	36.4	28.4	6.9	9.9	70.6	92.5	0.29	8.1	47	19.8			1235	9.48
84	2008	39	390003	ALTURAS	PULLMAN	60.8	26.7	28.2	7.3	9.5	69.5	87.3	0.35	7.7	84	23.7			1200	9.27
85	2008	39	390004	LOUISE	PULLMAN	61.7	24.6	37.7	8.2	9.4	69	88.6	0.32	7.5	81	18.2			1270	9.43
86	2008	45	450004	WA8047	PULLMAN	63.4	32.2	29.6	5.6	8.9	70.5	93.1	0.28	7.4	38				1315	9.79
87	2008	45	450005	EDEN	PULLMAN	62.6	29.9	26.9	6.3	8.7	68.3	89.6	0.29	6.8	42				1285	9.7
88	2008	46	460004	WA8047	LIND	62.7	35.6	27.6	7.1	14.3	70.7	86.9	0.38	12.4	83				1290	9.41

Table 16: Data set for WA8047

Obs	YEAR	NURSCO	LABNUM	VAR	LOCATION	TWT	SKHRD	SKWT	SKWTS	WPROT	FYELD	MSCOR	FASH	FPROT	VISC	FSV	RVA	MABS	CAVOL	CODI
89	2008	46	460005	EDEN	LIND	63.2	42.6	25	7	13.2	69.4	84.6	0.39	12.6	99				1275	9.26
90	2008	52	520013	EDEN	PULLMAN	60.9	20.1	27.4	6	9.3	68.9	89.7	0.3	7.8	53					9.31
91	2008	52	520015	WA8047	PULLMAN	60.2	13.9	28	6.9	10.1	69.8	92.8	0.27	8.1	52					9.79
92	2008	62	620050	WA8047	PULLMAN	60.9	21.2	28.6	6.7	9.8	72.2	95.2	0.28	8						
93	2008	62	620065	EDEN	PULLMAN	60.8	23.6	27.7	5.7	8.7	70.5	92.4	0.29	7.6						
94	2008	62	620084	LOUISE	PULLMAN	59.7	7.3	39.1	8.2	8.6	70.5	91.1	0.31	7.7						
95	2008	1056	560001	EDEN	PULLMAN	61.9	45.4	24.2	6.2	10.6	68.5	88	0.32	9.2	89	18.2		57.3	1235	9.39
96	2008	1056	560002	WA8047	PULLMAN	63.2	41.4	27.5	5.9	10.4	70.5	90.5	0.32	8.7	62	19.5		52.3	1255	9.63
97	2008	1056	560006	LOUISE	PULLMAN	59.9	24.8	32.2	8.3	10.6	67.9	84.6	0.36	9.3		18.2		53.8		9.43
98	2008	1056	560008	ALTURAS	PULLMAN	61.1	25	27.9	6.7	10.1	69.2	86.9	0.35	7.6		24.3		52.6		9.48
99	2008	2056	560009	EDEN	ENDICOTT	64.1	36.9	31.1	7.2	10.8	68.3	87.1	0.33	9.2	88	18.2		54	1240	9.23
100	2008	2056	560010	WA8047	ENDICOTT	64.9	36	34.1	7.3	11.8	69.6	83.6	0.41	9.8	127	23.4		54.3	1180	9.14
101	2008	2056	560014	LOUISE	ENDICOTT	63.3	19.7	43.1	10.4	11.4	68.2	86.3	0.34	9.7		17.9		55.3		9.09
102	2008	2056	560016	ALTURAS	ENDICOTT	62.6	24.6	32.9	9.6	12.6	70.6	84.9	0.41	11.1		22.5		58.1		8.84
103	2008	3056	560017	EDEN	FARMINGTON	62.4	28.8	31.8	7.2	9.5	70.3	89.6	0.33	8.3	51	18.6		53.6	1245	9.29
104	2008	3056	560018	WA8047	FARMINGTON	60.8	28.7	29	6.6	11.5	70.3	87.7	0.36	10.2	66	18.2		51.8	1265	9.59
105	2008	3056	560022	LOUISE	FARMINGTON	61.1	22	39.3	10.9	10	70.1	84.3	0.41	8.4		18.6		54.6		9.25
106	2008	3056	560024	ALTURAS	FARMINGTON	61.2	18.9	34.8	8.8	11.2	70.2	83.1	0.43	8.6		24		55.5		8.99
107	2008	6013	130001	ALPOWA	BICKLETON	60.4	18.7	28.5	6.5	11.7	65.1	81.1	0.36	10.5		22.8		58.3		8.49
108	2008	6013	130002	LOUISE	BICKLETON	59.9	16.8	34.1	8.4	11.1	69.3	87.1	0.35	9.4		22.5		57.5		9.16
109	2008	6013	130013	ALTURAS	BICKLETON	59.9	19.5	26.7	6.5	10.6	68.6	85.5	0.36	9.3		24		54.4		9.09
110	2008	6013	130015	EDEN	BICKLETON	61.7	29.5	25.4	6.2	9.7	67.7	85.7	0.34	8.4	75	21.3		53.3	1205	9.2
111	2008	6013	130017	WA8047	BICKLETON	62.1	29.4	26.7	5.8	10.3	69.9	89.1	0.33	8.8	65	22.5		51	1270	9.4
112	2008	7013	130019	ALPOWA	WALLA WALLA	63.4	23.1	35.9	8	12.9	67.3	80.7	0.41	10.9		21		58.8		8.73
113	2008	7013	130020	LOUISE	WALLA WALLA	59.6	23.9	34.8	9.3	12.5	68.1	81.1	0.42	10.6		18.2		59.4		9.1
114	2008	7013	130031	ALTURAS	WALLA WALLA	61.8	23.7	31.5	7.5	12.2	70.6	83.6	0.43	10.5		23.7		58		9.14
115	2008	7013	130033	EDEN	WALLA WALLA	63.6	35.7	29.4	7.1	12.3	69	83.5	0.4	10.3	90	19.5		57.5	1240	9.15
116	2008	7013	130035	WA8047	WALLA WALLA	62.5	32.6	30.1	7	12.9	68.8	83.9	0.39	11.1	83	19.5		55.5	1270	9.57
117	2008	8013	130037	ALPOWA	REARDAN	63.4	20.9	37.1	7.7	10.1	65.6	81.7	0.36	9.5		19.2		57		9.01
118	2008	8013	130038	LOUISE	REARDAN	62.5	21.4	39.9	10.6	9.1	70.3	87.1	0.37	7.9		21.3		55.3		9.38
119	2008	8013	130049	ALTURAS	REARDAN	62.1	18.4	34.9	7.6	11.2	69.2	81.8	0.43	9.8		24.9		56.6		9.09
120	2008	8013	130051	EDEN	REARDAN	62.4	41.4	29.9	7.4	14	66.5	74.6	0.49	11.5	95	18.6		59.1	1185	9.15
121	2008	8013	130053	WA8047	REARDAN	64.2	39.7	34.6	7.2	11	69.2	85.7	0.37	9.2	49	19.2		51.8	1255	9.5
122	2008	9013	130055	ALPOWA	HORSE HEAVEN	61.3	29.4	28.4	8.3	12.8	66.1	79.8	0.4	11.2		20.1		58.1		8.52
123	2008	9013	130056	LOUISE	HORSE HEAVEN	59.6	24	33.9	9.5	13.3	67.6	81.7	0.4	11.9		17.9		59.9		9.05
124	2008	9013	130067	ALTURAS	HORSE HEAVEN	60.6	28.9	27.2	8.2	13	69.7	81.8	0.44	11.7		23.1		59.3		8.9
125	2008	9013	130069	EDEN	HORSE HEAVEN	63.2	40.7	27.5	7.4	13.2	69	84.1	0.39	11.7	120	18.9		59.5	1145	9.25
126	2008	9013	130071	WA8047	HORSE HEAVEN	62.4	36.4	27.9	7.1	13.4	70.3	87.7	0.36	11.8	94	19.8		53.1	1140	9.41
127	2008	10013	130073	ALPOWA	ALMIRA	63.2	22.2	32.5	7.4	9.8	66.7	83.8	0.35	8.8		24		56.3		8.91
128	2008	10013	130074	LOUISE	ALMIRA	58.8	16.8	29.6	8.5	12	67.3	83.2	0.37	10.5		18.9		58.4		9.06
129	2008	10013	130085	ALTURAS	ALMIRA	61.1	18.8	27.4	7.9	10.1	69.4	85.3	0.38	9		25.2		53.6		9.29
130	2008	10013	130087	EDEN	ALMIRA	62	33.8	23.8	5.9	11.3	68.5	85.4	0.36	9.2	120	20.1		53.7	1215	9.31
131	2008	10013	130089	WA8047	ALMIRA	64.1	31.5	30.4	7.5	10.3	71.1	91.3	0.32	8.7	64	18.9		51	1210	9.65
132	2008	10042	420001	ALTURAS	PULLMAN	58.3	6.2	30	7.2	8.7	68	86.1	0.34	7.2	70	24.9				9.32
133	2008	10042	420002	LOUISE	PULLMAN	59.8	10.7	39	9.8	8.4	69.3	88.3	0.33	7.4	64	20.1				9.41
134	2008	10042	420005	WA8047	PULLMAN	61.1	16.6	29.8	6.7	8.2	70	91.8	0.29	7.2	41	19.8				9.57