# CENTER PIVOT CALIBRATIONS FOR APPLYING WASTEWATER

## A Quick Field Reference Guide

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This publication contains only a brief overview of the calibration procedure and data sheets used to calculate application uniformity of a center pivot applying wastewater. For a more detailed discussion and in-depth calibration steps, see <u>UGA Extension Bulletin 1458</u>.

**Step-by-Step Calibration Procedure** (Equations for calculations are on the following data worksheets)

- 1. Determine the *Wetted Diameter* of your nozzle or sprinkler.
- 2. Determine the *Collection Cup Spacing*. Generally, 25 feet up to max of 50 feet between cups.
- 3. Determine *Number of Cups Needed* to collect wastewater from all sprinklers/nozzles starting after the first tower.
- 4. Place collection cups in a row, equally spaced in the direction of travel.
- 5. Mark the starting point. Operate the pivot normally and mark the end point. Measure the *Time* taken for the system to pass over all cups. Measure between the start and end points to determine the *Travel Distance*.
- 6. Immediately record volumes or depths of water in

each collection cup.

- 7. Calculate *Average Application Depth* (inches, centimeters, or millimeters).
- 8. Determine **"usable" cups** and *Effective Diameter* of pivot.
- 9. Recalculate the *Average Application Depth* for the "usable" collection cups (using data from Proc. 7).
- 10. Calculate the reference *Travel Speed*.
- 11. Calculate the *Deviation Depth* for each "usable" collection cup.
- 12. Determine the *Average Deviation Depth* (using data from Proc.11).
- 13. Calculate the *Application Uniformity* (*U<sub>c</sub>*).
- 14. Determine the calibration results (using Table 1).

#### Table 1. Uniformity Coefficient meaning for wastewater application acceptability.

Uniformity Coefficient (U <sub>C</sub> )	Acceptability for Wastewater Application
100	Perfect application across center pivot to acceptable
85 – 99	Great application to acceptable
70 – 85	Good application to acceptable
Below 70	Not acceptable to adjustments required

**Reference** Hawkins, G.L., W. Porter, S. Hollifield, and B. Shirley. 2016. Calibration of Center Pivot Systems for Wastewater Applications, UGA Extension Bulletin 1458.

### **Collection Table for Calibrating a Wastewater Center Pivot System**

Date: \_\_\_\_\_ Name of Site/Field of Center Pivot System: \_\_\_\_\_

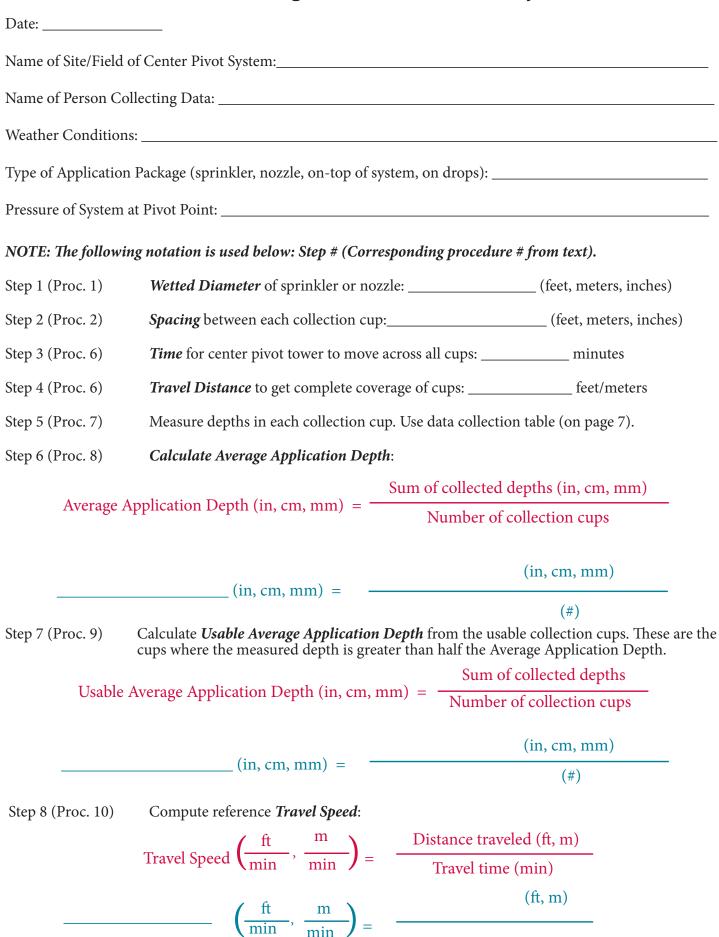
 Name of Person Collecting Data:
 Weather Conditions:

Type of Application Package (sprinkler, nozzle, on-top of system, on drops):

Pressure of System at Pivot Point: \_\_\_\_\_ Distance Between Collection Cups: \_\_\_\_\_

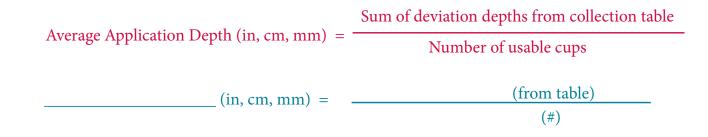
Collection Cup Label	Measured Depth of Liquid (in, cm, mm	Deviation Depth (Absolute difference from measured and average depth) (in, cm, mm)	Christiansen Uniformity Coefficient (U <sub>C</sub> )	Comments	
TOTAL SUM					
AVERAGE					

## **Calculation Sheet Used for Calibrating a Wastewater Center Pivot System**

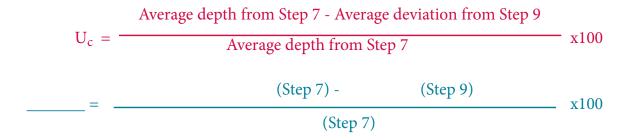


#### **Calculation Sheet Used for Calibrating a Wastewater Center Pivot System (continued)**

Step 9 (Proc. 11-12) Calculate Average Deviation Depth:



Step 10 (Proc. 13) Calculate *Christiansen Uniformity Coefficient (U<sub>c</sub>)*:



Step 11 (Proc. 14) Determine the calibration results using the table below.

Uniformity Coefficient (U <sub>C</sub> )	Acceptability for Wastewater Application			
100	Perfect application across center pivot to accept- able			
85 – 99	Great application to acceptable			
70 – 85	Good application to acceptable			
Below 70	Not acceptable to adjustments required			

#### Calculation of Application Rates Based on Different Ways of Measuring Volume in Collection Cups

If amount of liquid in collection cups (assuming equal diameter at top and bottom) is measured in inches, then the following **Gallons per Acre** were applied. The numbers are summative, so to calculate 1.5 inches, add the 1.0 and 0.5 numbers.

Inch in Cup	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
Gallons/Acre	2,715	5,431	8,146	10,862	13,577	16,292	19,008	21,723	24,439	27,154

The following table provides information on the **Gallons per Acre** applied if the volume in the collection cups is measured in milliliters (mL). The bolded numbers on the left side are in equal increments of inches.

Cup Mea	surement	mL in Collection Cups						
cm	inches	1	10	20	30	40	50	60
1	0.39	13,613	136,135	272,270	408,404	544,539	680,674	816,809
1.27	0.50	8,440	84,404	168,807	253,211	337,615	422,019	506,422
2	0.79	3,403	34,034	68,067	102,101	136,135	170,168	204,202
2.54	1.00	2,110	21,101	42,202	63,303	84,404	105,505	126,606
3	1.18	1,513	15,126	30,252	45,378	60,504	75,630	90,757
4	1.57	851	8,508	17,017	25,525	34,034	42,542	51,051
5	1.97	545	5,445	10,891	16,336	21,782	27,227	32,672
6	2.36	378	3,782	7,563	11,345	15,126	18,908	22,689
7	2.76	278	2,778	5,557	8,335	11,113	13,891	16,670
7.62	3.00	234	2,345	4,689	7,034	9,378	11,723	14,067
8	3.15	213	2,127	4,254	6,381	8,508	10,636	12,763
9	3.54	168	1,681	3,361	5,042	6,723	8,403	10,084
10	3.94	136	1,361	2,723	4,084	5,445	6,807	8,168
10.16	4.00	132	1,319	2,638	3,956	5,275	6,594	7,913
11	4.33	113	1,125	2,250	3,375	4,500	5,625	6,750
12	4.72	95	945	1,891	2,836	3,782	4,727	5,672
12.7	5.00	84	844	1,688	2,532	3,376	4,220	5,064
15.24	6.00	59	586	1,172	1,758	2,345	2,931	3,517

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