

# A Primer on PWTA

## With Special Relevance to the SITESPLUS® Software

### PWTA Definition

PWTA is an acronym for **Percent Within Trade Area** and describes the percentage of a store's sales that occur within the confines of the defined trade area of your project. It is sometimes called "Percent Explained", "Draw", "Primary Trade Area", or "Catchment Area" (although Catchment Area is far too indefinite for modeling purposes).

Some general rules:

- The closer a store is to the center of a trade area, the higher its PWTA.
- The higher the curve of a store, the higher its PWTA will likely be.
- The larger a trade area, the more of its stores will have high PWTAs.
- Stores of similar sizes and formats that are near to each other are likely to have similar PWTAs.
- It is bad modeling practice to simply assign all stores in the model to the same PWTA.
- In a balanced model, raising a store PWTA will result in a higher Power for that store. Lowering a PWTA will result in a lower Power for that store.

### Why It's Important

When the PWTA of a store is too high or too low, the surrounding sectors will have leakages that are too low or too high, respectively. That results in sales potential that is not distributed correctly and can affect the proper balance of a model.

Calculating leakage occurs as:

$$Leakage = \sum_{j=1}^n (Pop_j \times PCW_j) - \sum_{i=1}^m (Sales_i \times PWTA_i)$$

*For all stores "i" and sectors "j"*

From the above formula, you can easily see that incorrect PWTA values will result in inflated or deflated leakages across the trade area.

When balancing a model, if leakage is too high or low in a store's surrounding sectors, that store will have a calculated power that is too low or too high, respectively, and this can make it extremely difficult to balance the model without "forcing" it with lots of modifying features, such as manual powers, etc.

When the leakage values of the sectors are not correctly distributed, then converting leakage becomes more difficult and results in warped conversion figures and unreliable sales projections.



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### What Does PWTA Actually DO?

It is really important to understand that a store's PWTA does not affect its strength; a higher or lower PWTA does not make a store more or less competitive, at least not directly. In a balanced model, changing a store PWTA will change its trade area sales and its Power, but not the total sales. In a projection model, changing a new store's PWTA will not change its trade area sales, or its Power, but will change its overall sales. This can be confusing for beginning analysts. So, let's look closer.

**In a Balanced Model**, the PWTA dramatically affects a store's Power. In the balanced model a store has an Actual Sales figure and a PWTA. Those two figures determine the trade area sales of that store. Consider the following table for a store that has existing weekly sales of \$400,000:

	PWTA 50	PWTA 80
Trade Area Sales	\$200,000	\$320,000
Non-TA Sales	\$200,000	\$80,000
Total Sales	\$400,000	\$400,000

In the above table, if the store has a 50 PWTA, then it must achieve \$200,000 of sales from the trade area. But if we set the PWTA to 80, then the store must achieve \$320,000 of sales from the trade area – a MUCH harder task. In order to allow this performance, SITESPLUS will raise that store's Power when balancing.

If all other values are the same:

*Raising a store PWTA will cause the Power to increase*

*Lowering a store PWTA will cause the Power to decrease.*

**In a Projection Model**, the PWTA for existing stores is normally not changed. The PWTA for new stores will not change the trade area sales for that store, but it does have a direct relationship with secondary sales (sales outside the trade area). Let's look at an example.

*Store-1 has a PWTA of 50. Its trade area sales are \$120,000. Since the PWTA is 50, the \$120,000 represents 50% of Store-1's sales, so the overall sales will be \$240,000.*

Trade Area Sales	50%	\$120,000
Non-TA Sales	50%	\$120,000
Total Sales	100%	\$240,000

*If we change Store-1's PWTA to 30, its trade area sales will remain \$120,000. But now this only represents 30% of its total sales, so the total sales will be \$400,000. This is dramatically different from the sales breakdown above.*

Trade Area Sales	30%	\$120,000
Non-TA Sales	70%	\$280,000
Total Sales	100%	\$400,000



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### Methods for Determining PWTA

#### Visual Inspection

This is an important first step. Experienced analysts can have a good “gut feel” for each store’s trade area and where it stops (if they actually visited the trade area).

The analyst can see the area surrounding the edge of the trade area, but the software can’t. One part of the TA edge may have considerable population on the other side which provides good sales opportunities, lowering a store’s PWTA. Another edge may have a dead space, such as an ocean or desert which provides no sales opportunities at all, raising the PWTA.

#### Spotting and Loyalty Data

The best way to set PWTA is to use customer spotting or loyalty data.

**Customer spottings** are data gathered in the store about the actual customers as they check out with their purchases. The customer volunteers an approximate home location, and the data collector usually observes the sales amount. To get an accurate picture of the store trade area the study must collect hundreds, if not thousands, of customer intercepts, and the data collectors must be properly trained.

To determine the PWTA for a store from customer spotting that only counts the number of customers, not the amount of sales for each customer, divide the number of customers who live within the trade area by the total number of customers you have counted, as in the following formula. *If you have observed sales, not just counts, use the procedure for loyalty data instead.*

$$PWTA = \frac{\text{Customers Within the TA} * 100}{\text{Total Number of Customers Counted}}$$

**Loyalty data** are usually collected automatically for each customer when he/she presents the loyalty card at check-out time, but this only happens if the customer has signed up for a store loyalty card. This means that loyalty data will be missing for the occasional or irregular shoppers. Stores with the strongest loyalty programs will have the most accurate loyalty data, but they will still be weakest in identifying customers that live further from the store and may be outside the defined trade area. An additional weakness is that the customer addresses are not always up-to-date.

To determine the PWTA for a store using its loyalty data, follow these steps:

1. Retrieve the data for at least a full “normal” week. Avoid weeks before or during significant holidays, or weeks when the weather made travel difficult. This will likely result in too much data, so you may want to randomly retrieve only 10% of that data.
2. Add up all of the sales for the retrieved data and call that “Total Sample Sales”.
3. Add up all of the sales from that data ONLY where the customer lived within the trade area, and call that “TA Sample Sales”.



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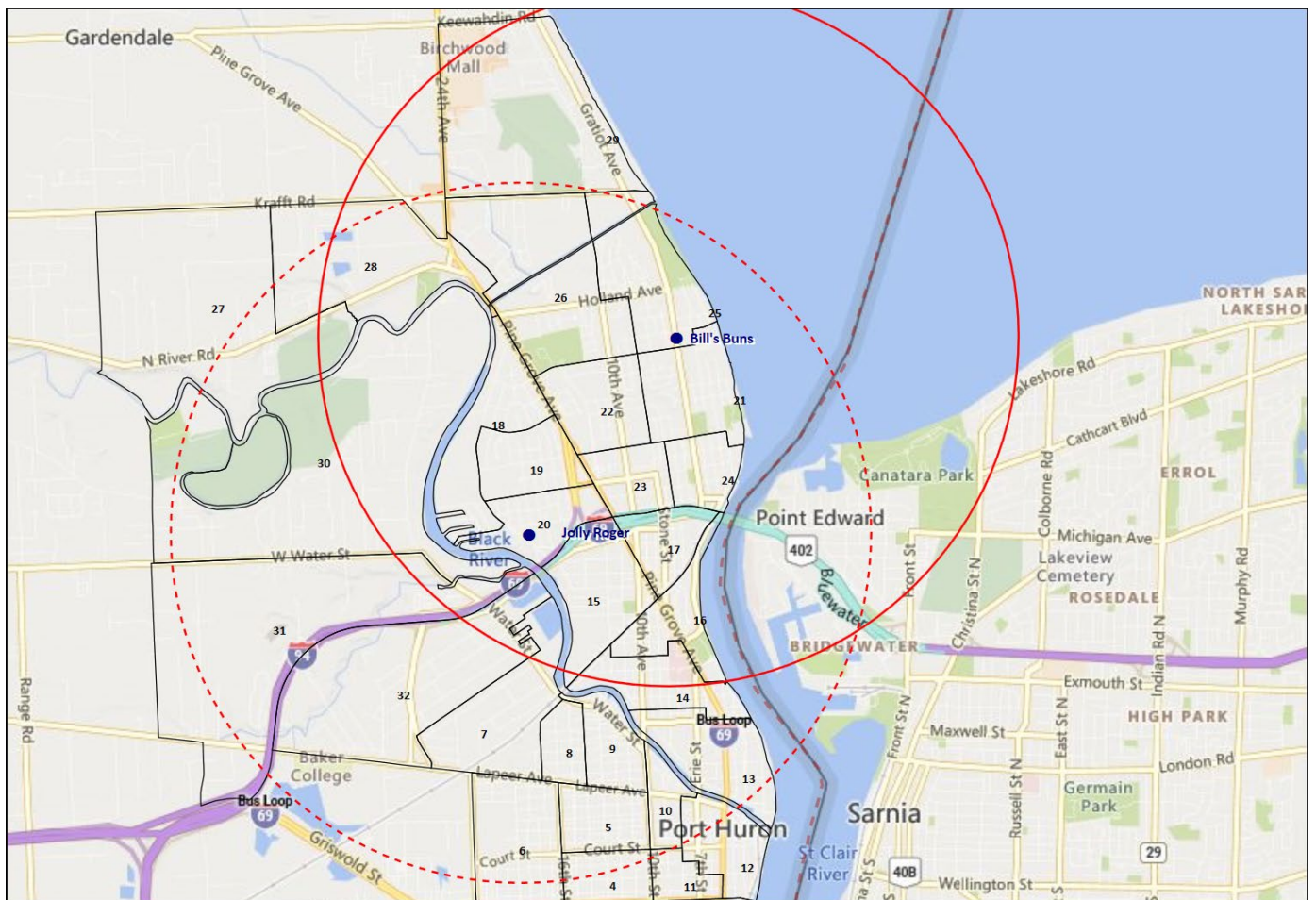
4. Now calculate this store's PWTA:

$$PWTA = \frac{TA \text{ Sample Sales} \times 100}{\text{Total Sample Sales}}$$

### Using a Radius

Based on a store's curve we can expect a certain percentage of sales to fall within a specific distance. This is analogous to the area under the distance-decay function for that curve. For example, a store with a curve of 75 is expected to achieve 90% of its sales within 2½ miles. *Keep in mind that this is based on a model radius of 2 miles.*

Armed with this fact, we can draw a "90% circle" around the store and estimate that 90% of its sales come from within that circle, but only if the entire circle falls within the trade area. By estimating the percentage of that circle falling within, we can then estimate the store's PWTA.



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The above map shows two stores, both with curves of 90. Looking at the table below, we determine that a 90% Distance for the stores is about 2.2 miles, so we have drawn rings of that size around both stores. Store-1 has the solid red ring, and a significant portion falls outside the trade area, perhaps 50%. We might be tempted to give the store a PWTA of 50.

Store-2 has a dashed red ring, and only a small portion falls outside the TA. We might estimate Store-2's PWTA to be around 90.

You may need to adjust your estimate up or down based on what lies outside the trade area boundaries as described in the Visual Inspection section described earlier. If significant portions of the circle's non-TA area lie in areas where there is no sales potential, then you must raise the PWTA estimate. In our example above, 50% of Store-1's circle falls outside the TA, but nearly all of that outside portion is over Lake Huron! We must adjust the estimated PWTA upward by a large amount.

The following table describes the 90% and 95% Circle Radii for many store curves, based on a model default radius of 2. To adjust for a different model radius used, multiple the Circle Radius from the table below by the actual model radius you have used, then divide by 2.

Curve	90% Distance	95% Distance
40	4.8	6.0
60	3.2	4.1
70	2.8	3.6
75	2.6	3.4
80	2.4	3.1
85	2.3	2.9
90	2.2	2.8
95	2.0	2.6
99	2.0	2.5

### Using Spokes

The use of radial spokes to estimate PWTA is similar to using a radius, but is a bit more complicated. The advantage is an almost certain increase in accuracy.

Instead of drawing a uniform circle around the store, draw a set of evenly-space radial spokes starting from the store and proceeding to the trade area boundary. You should draw as many as possible, at least 8-12. Now measure the distance of each spoke from the store to the edge of the trade area and write it down.



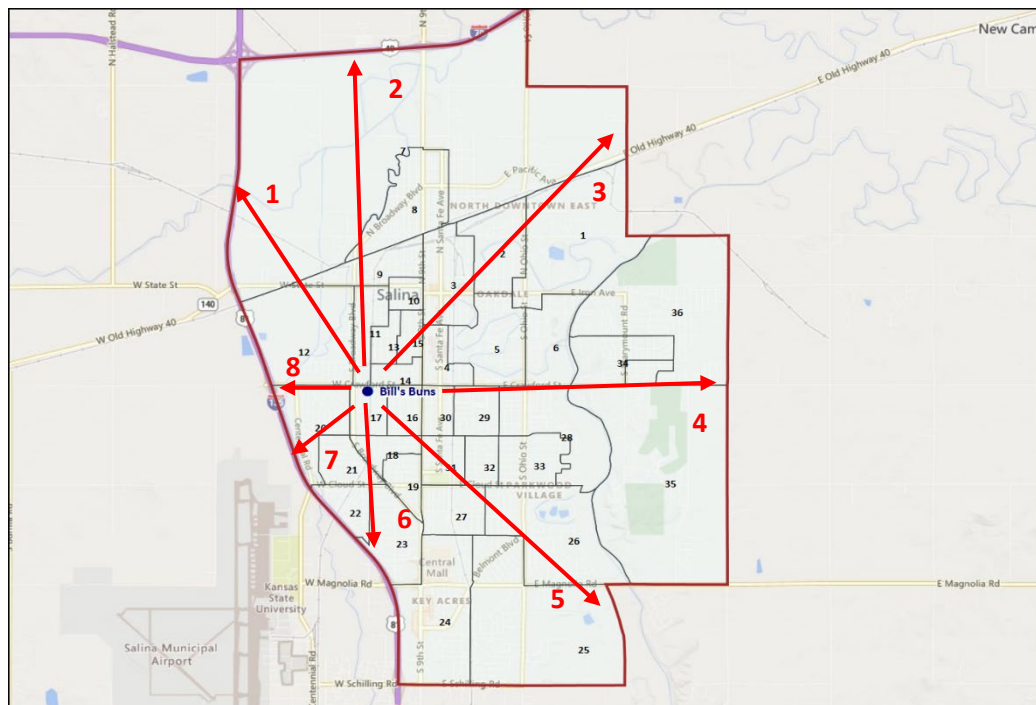
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When you are done, use the table below to look up each spoke's estimated percentage and record it. To improve accuracy, if a spoke ends at a water line or some other point with no population on the other side, record that percentage as 100 (or 99 if you are squeamish).

Distance in Miles	Store Curve, based on Model Radius of 2.00						
	40	60	70	75	80	85	90
.5	20	28	32	34	36	37	39
1.0	36	49	54	57	59	62	64
1.5	49	64	70	72	75	77	79
2.0	60	75	80	83	85	86	88
2.5	68	83	87	89	91	92	93
3.0	75	88	92	93	94	95	96
3.5	81	92	95	96	97	97	98
4.0	85	94	97	97	98	98	99
4.5	89	96	98	98	99	99	
5.0	91	97	99	99			
5.5	93	98					
6.0	95	99					

Here's an example. The map below shows a single store with 8 spokes drawn to the edge of the trade area. The store has a curve of 80.



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Our store has a curve of 85, so we use the above table to look up the relative percentages of each spoke based on its distance. This results in the following:  
(table)

To estimate the store's PWTA, we use the following formula:

$$PWTA = \frac{\sum_{i=1}^n \text{Percent}_i}{\text{Number of Spokes}}$$

In our example, we get:

Spokes ►	1	2	3	4	5	6	7	8
Distances	.75	4.0	3.5	3.5	4.0	1.4	.6	.4
Percents	47	98	97	97	98	73	38	34

The sum of all the percentages is 582. Our estimated PWTA is  $582/8 = 73$ . Of course, this is without any modifiers because of the lack of population on the other side of the trade area boundary. Spokes 7 and 8 only point to an airport with no population, so if we increase those two spokes to 100% each, then our estimated PWTA is:

$$PWTA = \frac{712}{8} = 89$$

### How Can I Tell if PWTA Values Are Correct?

To determine if your store PWTA values are correct, you must ask yourself several questions, and the answers must always be "Yes".

- Are the values explainable to another professional? That is, do they make sense when you try to explain them? Do they make sense when you just look at them?
- Do the PWTA values for stores with spotting or loyalty data actually match the data? Those types of data are never perfect, but they are the best actual values you can get, so don't be tempted to ignore them without good reason.
- Do stores of similar sizes and formats located near each other have similar PWTA values? If not, can you explain the difference?
- Is your overall trade area leakage reasonable? In today's economic environment it is highly unlikely a trade area will have an overall leakage of less than 30%. Consider the number of convenience stores, dollar stores, home centers, and other formats that are not in your model, but do sell supermarket-type merchandise – even if it's only beverages, pet supplies, and paper products.

