



Annual Winter Maintenance Report

FY 2012



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INTRODUCTION

Winter Maintenance in Indiana

With safety being INDOT’s number one priority as an agency we find that keeping the traveling public safe on Indiana’s more than 30,000 lane miles of state highways must be the first priority and goal of INDOT’s snow and ice removal operations.

INDOT monitors the effectiveness of its fleet of over 900 snowplows and 1,700 snowplow drivers through performance targets that are based on public safety, driver expectations, and speed based upon recovery time in order to regain to what is considered to be a normal commute speed. Ongoing studies continue searching for the best methods of tracking and monitoring our performance using these methods.

Training and technology help snowplow operators stay safe and make the right decisions in selecting and applying winter maintenance chemicals to increase efficiency and limit environmental impacts. INDOT is committed to exploring and staying current with the new technologies and ideas that enhance our snow and ice removal operations in an effort to reduce our overall operational costs while still yet providing excellent customer service.

We continue to maintain a partnership with Purdue University and an active in-house maintenance research program that investigates and adopts innovative strategies that continues to improve INDOT’s snow and ice removal operations.

Below the following tables will summarize and compare various operational data, weather data, and material usages for this past winter season and comparisons with prior seasons’ data.

Table #1 Infrastructure:

In the table below you will find in column two the number of lane miles each district is responsible for and in column three the number of snow routes that each district has by design. The number of routes will determine the specific number of drivers and trucks that are needed in each district for winter operations. Column four shows the current number of CDL drivers we have staffed. In column five we show the number of CDL drivers required for a state wide event. The last column shows the average routes length by design. We are continuously looking for opportunities and methods that allow us to increase snow route lengths which automatically result in lower operational costs by reducing the number of trucks and drivers that are needed.

Infrastructure

District	Lane Miles	Routes	Drivers	Required	Average Route
Crawfordsville	5066	146	287	292	34.7
Fort Wayne	4944	143	282	286	34.6
Greenfield	5369	179	347	358	30.0

Laporte	5615	174	329	348	32.3
Seymour	4906	148	287	296	33.1
Vincennes	4769	138	267	276	34.6
State Totals	30,539	928	1799	1856	32.9



WEATHER HOURS

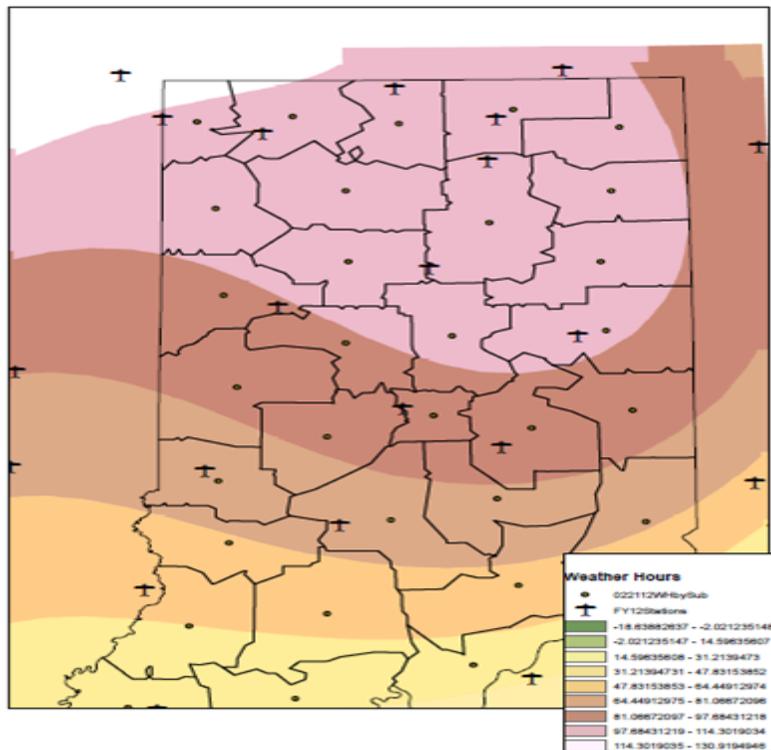
Table # 2 Weather Hours:

In the table below you will find the number of weather hours that were observed at preselected National Weather Service locations. We use these numbers as a measurement to determine a season's winter severity. We also insert the numbers into the map below which triangulates the weather hours and gives a more specific number to each location across the state. We then use these numbers to set performance standards, set operational strategies, and specific operational goals.

Weather Hours

District	Average	2009	2010	2011	2012
Crawfordsville	336 hrs.	327 hrs.	504 hrs.	413 hrs.	98 hrs.
Fort Wayne	405 hrs.	481 hrs.	522 hrs.	480 hrs.	136 hrs.
Greenfield	337 hrs.	327 hrs.	504 hrs.	413 hrs.	104 hrs.
Laporte	321 hrs.	391 hrs.	352 hrs.	398 hrs.	142 hrs.
Seymour	152 hrs.	127 hrs.	213 hrs.	195 hrs.	74 hrs.
Vincennes	104 hrs.	67 hrs.	137 hrs.	161 hrs.	52 hrs.
State Averages	276 hrs.	287 hrs.	372 hrs.	343 hrs.	101 hrs.

Weather Hours 2/21/12



MATERIALS

Table # 3 Tons of Salt Used:

In the table below you will see the four year average salt usage along with each individual year's district usage. By monitoring and tracking salt usage we can plan our needs and cost based off of averages. We can also measure and track to see if there is any correlation from year to year in an effort to establish best practices during various winter types and patterns.

Tons of Salt Used

District	Average	2009	2010	2011	2012
Crawfordsville	42,374	41,047	55,390	48,157	24,903
Fort Wayne	61,423	70,321	67,107	69,202	39,061
Greenfield	55,625	59,644	66,809	63,173	32,875
Laporte	73,828	87,897	85,316	86,591	35,507
Seymour	34,298	39,531	43,533	41,513	12,616
Vincennes	27,015	25,846	39,177	32,594	10,444
State Averages	49,094	54,048	59,555	56,872	25,901

Table # 4 Tons of Salt Used per Weather Hour

In the table below you will see our four year average salt used per weather hour at each district. We compare the salt usage to the number of weather hours observed to see if we are consistent in our application practices. In column two we subtracted our high usage from our lowest usage to get the difference. As you can see in the table below we are very inconsistent except for our Laporte District.

Tons of Salt Used per Weather Hour

District	Difference	2009	2010	2011	2012
Crawfordsville	144	126	110	117	254
Fort Wayne	158	146	129	144	287
Greenfield	183	182	133	153	316
Laporte	32	225	242	218	250
Seymour	141	311	204	213	170
Vincennes	96	386	286	202	201
State Averages	126	188	160	166	256



CAPACITIES

Table # 5 Salt Storage and Capacities:

The table below indicates the amount of salt that we have on hand for next year as we start the season. We consider our total storage capacity along with our ten year average usage and take into consideration that we are obligated to purchase 80% of our total QPA to help us determine the amount we need to purchase in the next fiscal year for the next winter season. The last two columns indicate the tons requested and the estimated projected cost for the 2013 Salt QPA based off of an average current 2012 pricing that IDOA is also negotiating for 2013.

Salt Storage and Capacities

District	On Hand	Capacity	2013 QPA	Estimated Cost
Crawfordsville	43,713	46,800	34,000	\$2,618,000.00
Fort Wayne	54,800	57,700	43,000	\$2,967,000.00
Greenfield	46,742	75,120	40,000	\$2,680,000.00
Laporte	72,426	95,200	46,000	\$2,622,000.00

Seymour	30,115	55,500	28,000	\$1,876,000.00
Vincennes	31,987	50,400	16,000	\$1,104,000.00
State Totals	279,783	380,720	207,000	\$13,867,000.00

Table # 6 Salt Brine Usage, Capacities, and Equipment

The table below looks at this year and last year's salt brine usage. We also inventory what equipment we have and our storage capacity in order to successfully plan our liquid uses. Best practices have indicated that we can lower our operational costs by properly utilizing salt brine applications. This data will be beneficial in our 2013 Liquid Route Plan.

Salt Brine Usage, Capacities, and Equipment

District	2011 Usage	2012 Usage	Capacities	Makers	Applicators	Tankers
Crawfordsville	263,137	128,500	65,000	8	12	1
Fort Wayne	17,689	17,400	75,000	4	8	0
Greenfield	293,021	428,781	172,000	11	23	1
Laporte	1,460,252	2,587,800	235,410	10	21	3
Seymour	608,608	183,283	132,000	5	26	2
Vincennes	165,867	214,622	94,000	7	14	1
State Totals	2,587,328	3,511,632	773,410	44	104	8



DIESEL

Table # 7 Diesel Fuel Usage

The table below shows the diesel fuel usage during the past four years and will give you the four year and state average. We monitor the diesel fuel usage as a way of gauging our cost on this activity from year to year. We continue to study to see how fuel consumption is impacted by winter severity as well.

Diesel Fuel Usage

District	Average	2009	2010	2011	2012
Crawfordsville	217,263	235,428	254,455	247,923	133,247
Fort Wayne	273,260	301,249	288,480	302,470	200,841
Greenfield	290,002	313,083	347,598	325,060	174,268
Laporte	336,490	367,287	382,000	385,937	210,734
Seymour	202,144	215,260	232,465	228,929	131,920
Vincennes	134,772	151,755	173,094	129,581	84,659
State Averages	242,321	264,010	279,682	269,983	155,945

Table # 8 Gallons per Weather Hour per District and Table # 9 Miles per Gallons per Service Mile

In the tables below you will see each districts annual fuel usage per weather hour and the difference over the four year period. Also we have the gallons per service mile and difference. Again we find no correlation.

Gallons per Weather Hour per District

District	Difference	2009	2010	2011	2012
Crawfordsville	855	720	505	1102	1360
Fort Wayne	898	628	579	800	1477
Greenfield	986	957	690	1321	1676
Laporte	556	939	1085	928	1484
Seymour	692	1695	1091	1301	1783
Vincennes	1520	2265	1263	745	1628
State Averages	918	1201	867	1033	1568

Gallons per Service Mile

District	Difference	2009	2010	2011	2012
Crawfordsville	1.09	3.09	4.18	3.92	3.12
Fort Wayne	0.80	4.07	4.19	4.22	3.42
Greenfield	0.95	3.35	4.30	3.87	3.78
Laporte	1.14	4.51	4.66	4.37	3.52
Seymour	1.46	2.85	3.18	3.20	1.74
Vincennes	1.68	2.73	3.43	3.73	2.05
State Averages	1.19	3.43	3.99	3.89	2.94



LABOR

Table # 10 Labor

The table below shows the annual man hours that were reported to winter activities over the past four years. We continue to look for ways to gauge our time spent to winter severity and to identify consistency that is based off of the winter seasons weather patterns.

District Man-hours per Fiscal Year

District	Averages	2009	2010	2011	2012
Crawfordsville	49,385	47,435	55,401	52,019	21,342
Fort Wayne	61,134	73,433	65,640	69,049	36,414
Greenfield	67,161	74,557	84,783	73,208	36,096
Laporte	82,004	100,393	98,010	91,634	37,977
Seymour	41,001	50,455	49,314	48,295	15,940
Vincennes	25,923	32,386	34,386	27,494	9,424
State Totals	326,608	378,657	387,533	361,699	157,193

Table # 11 Man Hours per Weather Hour

In this table we show the total man hours that were reported divide by the total number of weather hours that were officially observed. Once again we find no correlation from one year to the next or from one district to another district indicating our pattern of inconsistency across the state.

Man-hours per Weather hour

District	Difference	2009	2010	2011	2012
Crawfordsville	121	145	110	231	218
Fort Wayne	142	153	126	183	268
Greenfield	179	228	168	298	347
Laporte	58	257	278	220	267
Seymour	182	397	232	274	215
Vincennes	325	483	251	158	181
State Totals	168	277	194	227	249

RESEARCH AND INNOVATION



Liquid Routes Study and Plan

Over the past few years in the Laporte District we have continued to experiment and increase the use of salt brine as a deicer and we have seen a potential for lowering our overall snow and ice removal cost without compromising our level of customer service. This year we began a study through JTRP with the help of Dr. Bob McCullouch to research the use of salt brine as a deicer and not just for pre-treat as an anti-icer. Below is an after action report from various selected routes across the state where we could compare routes that used various product applications during similar weather patterns. The official report from Dr. McCullouch will not be available until after the National Weather Service has posted the last winter months weather to be available towards the end of May. Based off the data that was available we are finding that the opportunities where we were able to combine both granular and liquid together is where we received the best results. We had selected areas complete the AAR and then we compared what they reported in WMS and again we found inconsistency in the data that we use. One way that we can ensure that the data is not compromised is to utilize non CDL construction supervisors to assist within the maintenance units during the winter months as designated loader operators and data collectors for material usages. As we increase our brine usages we will also need loader operators that can keep the brine made and storage tanks filled. We are planning on selecting at least 60 routes across the state that will use brine as a liquid route or liquid combination route. We will visit each district and work together as a team to find routes that we believe we will be able to show success with this type of application. We also plan to increase our brine making and storage capacity by 20 % across the state this year. As part of the research study we built a combination slide in unit that has the ability to apply both granular and liquid brine at the same time. We have not had a chance to test this innovation in an actual snow and ice operation. At the end of this report we have several photos of this new applicator that was solely manufactured in-house at the Indianapolis Shop in the Greenfield District.

Table # 12 After Action Report

1-19-12

Snow event with varying amounts of snow. This storm lasted approximately 12 hours and had high winds. Pavement temps ranged from 30 to around 10.

Location and Snow amount	Application	Results
LaPorte – 4.5 in.	Brine – 80 gal./mile	good
Angola – 1-1.5 inches	Salt – 250-300#/mile	good
Monticello – 2.5 in.	Salt – 250-300#/mile	good
	Brine- 100 gal/mile – alternated with salt	excellent
Bluffton – 1.5 in.	Salt – 250#/mile	good
Centerville – 0.5 in.	Salt – 350#/mile	excellent



TECHNOLOGIES

MDSS

MDSS is a product of Meridian Environmental and stands for Maintenance Decision Support System. We initially began testing this system in the early 2000's and went state wide in 2008. The initial report on results indicated significant savings from the use of this system. However over time this system had not performed as well as expected over the past three winters, but it was proven to be a tool that requires the consideration of different options intended to lead to decisions that offer the most benefit to INDOT's operations. We shut off several routes this year and used a selected sub in each district except in Seymour where we utilized all five sub districts. In December we realized that we needed more routes to help in the forecasting portion of this system so we had routes turned back on in every sub district. Over the course of this process and this season it has been realized that our level of inefficiency was not from this system not functioning as intended but rather the manner in which we trained our supervisors and our decision makers in-house on how to make good decisions and use the data and recommendations that are offered by this system. We continue to see great variances and inconsistency across the board in our snow and ice operations which to some degree it can be alleviated through the proper use of this technology. We have made some feature changes and significantly lowered our overall operational cost of this system for FY 2013.

RWIS Weather Stations

Conventional winter maintenance strategies involve waiting for the snow to start falling and then deploying plows and salt trucks to clear the pavement of snow and ice. These strategies produce safe travel conditions but give the storm the upper hand. Scientist has estimated that it takes ten times more material to remove a hard pack of snow and ice than it takes to prevent it. With the use of RWIS which is a product of Vaisala Inc. the acronym stands for Road Weather Information System. Anti-icing requires applying deicing chemicals before the storm hits, so that snow and ice never get a chance to bond to the pavement. Motorist will get safer travel conditions, and the agency uses less materials which is not only more economical but also better for the environment. Crews can also be more efficiently scheduled, thereby minimizing expensive overtime and standby costs. We currently have 28 operational systems strategically placed across the state and 7 along the Indiana Toll Road. We recently have added a new system at Covington, Fowler and on I-865 that are waiting on phone lines to be connected. We are also in the process of adding systems on construction projects such as US 31 and SR 38 in the Greenfield District and at the I-641/I-70/SR 46 interchange in the Crawfordsville District. We had a system that was destroyed in a vehicle accident at I-74 and SR 75 in Crawfordsville that we are in the process of replacing. Once all these systems become operational we will have a total of 34 and we would like to add three or four more over the next three years to complete our coverage grid that we have designed. We also are in the process of upgrading 10 older sites to the newer technologies and installing cameras. We have formed a state wide committee with representatives in each district that will help govern these technologies and keep everyone informed of this process within their respective districts.

FACILITIES



FY 2012

In facilities the Sullivan Unit has been completed. The Michigan City Unit has also been completed. The Westfield Unit salt building has been completed. The Markle Unit salt building will be completed in May once the asphalt plants are up and running.

The Fort Wayne Administration Building is currently under construction. The Cambridge City Sub truck pre-wash pit is to be let for bid in April. The Chesterton Unit wash bay will also be let for bid in April. The Wabash salt building is to be let for bid in May and is to be completed by fall.

FY 2013

We plan to build the new Aurora Sub District and Unit building. We also plan to build the new Lebanon Unit with a new salt building. We plan to build a new Unit Building at Westfield. At the Falls City Sub District we plan to construct a new salt building. In Fort Wayne plans are underway to build the new Materials and Testing Facilities. If the property can be purchased there are plans to build the Brownstown Unit salt building.

Summary

Our focus and goal moving forward is to create an annual snow and ice operations training curriculum for INDOT supervisors that will include utilizing technologies that we have available, enhance decision making processes, and improve data collection in an effort to create a system that is not compromised and offers useful data that enables us to affectively evaluate our performance. To increase our use of liquids and studies of products and application processes that can result in lowering our overall operational costs while maintaining excellent customer service. To continue evaluating and improving our facilities, technologies, and our operational processes.

FY 2012 Annual Winter Maintenance Report



Liquid/Granular Combination Vehicle



Current RWIS Locations

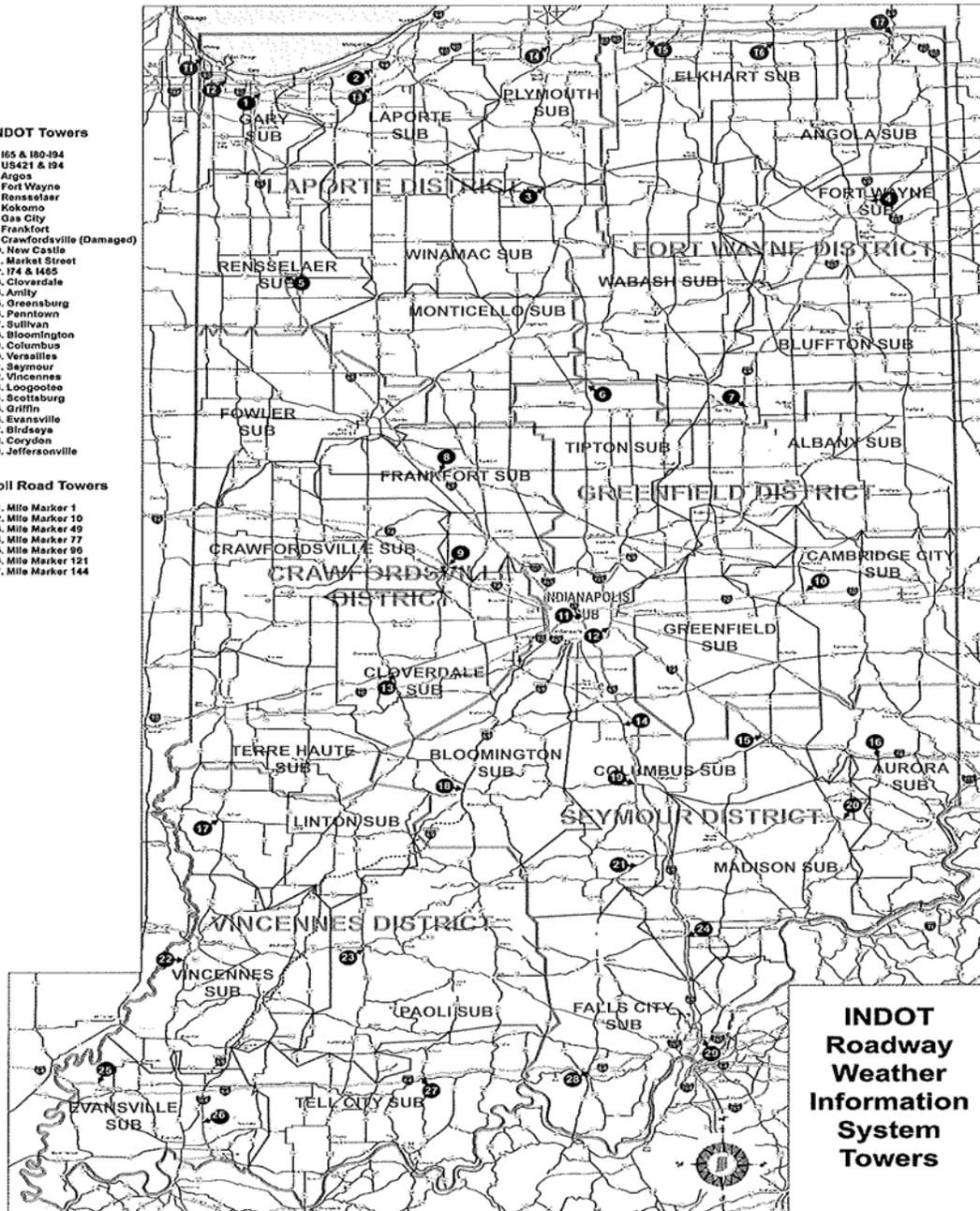


INDOT Towers

- 1. I65 & I80-194
- 2. US421 & 194
- 3. Argos
- 4. Fort Wayne
- 5. Rensselaer
- 6. Kokomo
- 7. Gas City
- 8. Frankfort
- 9. Crawfordsville (Damaged)
- 10. New Castle
- 11. Market Street
- 12. I74 & I465
- 13. Cloverdale
- 14. Antly
- 15. Greensburg
- 16. Penntown
- 17. Sullivan
- 18. Bloomington
- 19. Columbus
- 20. Versailles
- 21. Seymour
- 22. Vincennes
- 23. Loogootee
- 24. Scottsburg
- 25. Griffin
- 26. Evansville
- 28. Corydon
- 29. Jeffersonville

Toll Road Towers

- T1. Mile Marker 1
- T2. Mile Marker 10
- T3. Mile Marker 49
- T4. Mile Marker 77
- T5. Mile Marker 96
- T6. Mile Marker 121
- T7. Mile Marker 144



**INDOT
Roadway
Weather
Information
System
Towers**

