

NJDOT Highway Maintenance Crew Worker Title Consolidation

FINAL REPORT
MARCH 2015

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In cooperation with

New Jersey
Department of Transportation
Bureau of Research

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TECHNICAL REPORT
STANDARD TITLE PAGE

| | | | |
|--|--|---------------------------------------|-----------|
| 1. Report No. NJ-2015-003 | 2. Government Accession No. | 3. Recipient's Catalog No. | |
| 4. Title and Subtitle NJDOT Highway Maintenance Crew Worker Title Consolidation | | 5. Report Date March 2015 | |
| | | 6. Performing Organization Code | |
| 7. Author(s) Christopher Titze, Jonathan DeVries | 8. Performing Organization Report No. | | |
| 9. Performing Organization Name and Address Cambridge Systematics, Inc. 38 East 32nd Street, 7th Floor New York, NY 10016 | | 10. Work Unit No. | |
| | | 11. Contract or Grant No. | |
| 12. Sponsoring Agency Name and Address New Jersey Department of Transportation P.O. 600 Trenton, NJ 08625 | | 13. Type of Report and Period Covered | |
| | | 14. Sponsoring Agency Code | |
| 15. Supplementary Notes | | | |
| 16. Abstract | | | |
| 17. Key Words Highway Maintenance Crew Worker Title Consolidation | 18. Distribution Statement | | |
| 19. Security Classif. (of this report) Unclassified | 20. Security Classif. (of this page) Unclassified | 21. 27 pages | 22. Price |

Form DOT F 1700.7 (8-69)

ACKNOWLEDGEMENTS

The authors of this report wish to thank in particular the staff of the New Jersey Department of Transportation (NJDOT), as well as the State Departments of Transportation in California, Delaware, Illinois, Michigan and New York, without whom completion of this report would not have been possible.

TABLE OF CONTENTS

| | Page |
|--|-------------|
| The research team is not making any formal recommendations to NJDOT's Human Resources Department, but is providing guidance on the various aspects of highway maintenance crew worker title consolidation. This guidance is based on the research team's findings from its literature review, survey program and interview program, and is intended to allow NJDOT to make the most informed decisions that best meet their needs. | |
| EXECUTIVE SUMMARY | 1 |
| OBJECTIVES | 2 |
| INTRODUCTION..... | 3 |
| SUMMARY OF the LITERATURE REVIEW | 3 |
| Key Resource Materials..... | 3 |
| Peer Reviewed Agencies..... | 5 |
| Agency Overview | 6 |
| SUMMARY OF WORK PERFORMED..... | 9 |
| Literature Review | 10 |
| Peer Review..... | 10 |
| Survey Program | 12 |
| Interview Program..... | 13 |
| Research Findings | 13 |
| CONCLUSIONS AND RECOMMENDATIONS..... | 18 |
| Conclusions | 18 |
| Recommendations | 19 |

LIST OF APPENDICES

- APPENDIX A: Peer Agency Survey Form**
- APPENDIX B: State DOT Maintenance Worker Series Fact Sheets**
- APPENDIX C: Worker Fact Sheets**
- APPENDIX D: State DOT Maintenance Worker Title Comparison Matrix**
- APPENDIX E: State DOT Phone Interview Meeting Minutes**
- APPENDIX F: Maintenance Title Consolidation Concept Plan**

EXECUTIVE SUMMARY

Cambridge Systematics, Inc. (the “research team”) undertook research to assist NJDOT’s Highways Department in how to best consolidate their highway maintenance worker titles into more generalized and less specialized titles. The research approach consisted of the following steps:

- Examining existing highway maintenance crews’ structures, consolidation efforts made by state Departments of Transportation (DOT), and best practices for achieving consolidation based upon the body of highway maintenance crews literature, policies and procedures of other states or federal entities;
- Reviewing NJDOT’s current highway maintenance crews;
- Gathering information on how other state DOTs are achieving highway maintenance worker title consolidation; and
- Summarizing recommendations for highway maintenance worker title consolidation.

The best practices review collected information from state and federal studies, reports, and websites that mentioned highway maintenance worker title consolidation procedures. A thorough analysis was then performed on NJDOT’s existing highway maintenance crew structure, identifying strengths and weaknesses in the current structure and composition of highway maintenance worker titles. An interview program, with other DOT staff, was designed and implemented to enhance the literature review and existing policies evaluation. Peer agency interviews were conducted with:

- California Department of Transportation (Caltrans)
- Delaware Department of Transportation (DelDOT)
- Illinois Department of Transportation (IDOT)
- Michigan Department of Transportation (MDOT)
- New York State Department of Transportation (NYSDOT)

Information gathered in the literature review, existing policy evaluation, and interview program were summarized into findings and recommendations for future highway maintenance worker title consolidation.

BACKGROUND

Highway maintenance crews operate in all 50 states. They are responsible for year-round maintenance, construction, landscaping and winter treatment of all state-operated roads and highways. These crews originated virtually at the same time as did state-

owned highways. This relatively long employment history and existence of 50 different state DOTs means that the structure of a highway maintenance crew can vary greatly from state to state.

In order to ensure that its highway safety crews are following best practices in this field and are maintaining modern crew structures, NJDOT commissioned Cambridge Systematics to conduct research on various state highway maintenance crews and report their findings. By comparing its crews to other highway maintenance crews, NJDOT can better structure these crews and positions to meet today's needs. This is especially relevant because many highway maintenance crew positions were created in the 1930's and their job descriptions may need to be revised to keep pace with changes in demand and technology; other positions may be eliminated or consolidated to maximize a crew's utility.

Research from this effort, which included surveys and interviews in addition to research, found that highway maintenance crew positions vary greatly in their number, description, salary range, experience and license requirements, and knowledge, skills and abilities for the job. Caltrans has seven different positions that may comprise a crew at any time, while research only revealed four different PennDOT highway maintenance positions. Illinois' crews have some of the highest-earning positions, while Delaware spends the highest percentage of its total state revenue on its DOT: 10%. All of the aforementioned categories differ from state to state in structure and composition.

The research team does not make any formal recommendation to NJDOT on a consolidation method. But rather offers general guidance on highway maintenance title consolidation and lessons learned from observed efforts. Provided conclusions and recommendations are based on the research team's findings from its literature review, survey and interview program, and is intended to allow NJDOT to make the most informed decisions that best meet their operational and organizational objectives.

OBJECTIVES

The primary objective of this research is to examine the structure of State Departments of Transportation' highway maintenance crews and report upon all issues, trends, and other information relevant to highway maintenance crews and worker title consolidation.

Particular questions to be answered included:

- If a State Department of Transportation made worker title consolidation efforts, what were their experiences through this process and what can be learned from these consolidation efforts?
- What are the career trajectories of highway maintenance crew workers, both within and outside of, highway maintenance crews?
- How do target State Departments of Transportation recruit for their highway maintenance crew openings?

In addition to the information gathered from State Departments of Transportation on the structure of highway maintenance crews and worker title consolidation efforts, the study team was charged with outlining the general specifications of highway maintenance crew positions in target DOTs and summarizing the experiences of other State DOTs in their worker title consolidation efforts and any guidelines and/or policies they currently have in place related to worker title consolidation.

INTRODUCTION

In order to more fully understand the best practices of highway maintenance crew structures, the research team examined the following state Departments of Transportation (DOTs): California, Delaware, Illinois, Michigan, New York, New Jersey and Pennsylvania. This research included website research, surveys and interviews on an overview of each state DOT, titles and job descriptions of highway maintenance crews, the recruitment and training for these positions, as well as their anticipated career path. This research is combined to help assess NJDOT's own highway maintenance structure and identify any potential improvements that NJDOT may wish to make. The final report will outline how the aforementioned states structure their highway maintenance crews and include any additional information that is pertinent to NJDOT's assessment of how they structure their highway maintenance crews.

SUMMARY OF THE LITERATURE REVIEW

The research team conducted a literature review of DOT highway maintenance crews and the US Navy to gather information on how highway maintenance crews are structured and how consolidations are undertaken. Unlike traditional literature reviews, this one focused around DOT websites for California, Delaware, Illinois, Michigan, New York, New Jersey and Pennsylvania; this is because there is a dearth of articles written about the structure of highway maintenance crews and information available through DOT websites because they are public entities. Any DOT website was trusted for its accuracy and reliability, though some states were more transparent and exhaustive with their information than other states. In addition to reviewing DOT websites, the study team also reviewed state websites and the US Census website to acquire data on states' overall revenues, fiscal year budgets and DOT budgets. The following summarizes the key resource materials and the documents examined for each peer reviewed agency.

Key Resource Materials

New Jersey Department of Transportation website

The research team utilized the "Employment Opportunities" section of the New Jersey Department of Transportation website. The "Current Openings" yielded no results, as there were not current openings at the time, but the "Titles" section provided some information. This section yielded information on the following job titles: Maintenance Worker 1, Transportation; Maintenance Worker 2, Transportation; Repairer. This

resource provided limited information and did not yield any details on highway maintenance workers' career path nor provide specific salary information.

California Department of Transportation website

The most useful portions of this website included the Caltrans Maintenance Series, California State Personnel Board Specification and job postings. These documents yielded the titles and definitions of seven maintenance worker series positions. These sections did not yield information on highway maintenance workers' career path or salary information, unless it was included on individual job postings.

Delaware Department of Transportation website

The Delaware Department of Transportation's website provided the most useful information via its job postings. This section provided information on available jobs for maintenance crew related positions. It did not yield information on highway maintenance workers' career path but did provide salary information on the individual job postings.

Illinois Department of Transportation website

The Illinois Department of Transportation's website revealed most information through the "Work 4 Illinois" web page and the Illinois Department of Central Management Services Alphabetical Index of position titles. The "Work 4 Illinois" page allows one to download individual job titles by doing a full title name or keyword search. The Alphabetical Index only contains the title codes and their corresponding salary steps, but no title definitions or descriptions. These resources did yield information on highway maintenance workers' career path, listed as requirements for higher-level class positions.

Michigan Department of Transportation website

The research team utilized MDOT's website to access the Michigan Civil Service Commission's job specifications. This yielded the titles and definitions of more than ten Transportation Maintenance Worker positions. However, finding information on highway maintenance workers' career path was not possible: job postings list that there are promotional opportunities, without giving specific details. Likewise, salary information was not readily available, except on the individual job postings that were available.

New York State Department of Transportation website

New York State's Department of Transportation website yielded relevant information through their Highway Maintenance Worker Series option. This resulted in gathering worker title information and definitions of: HMT1, HMT2, HMW1 and only the title of HMW2. This resource did not yield information on highway maintenance workers' career path and only yielded salary information up to HMW1.

Pennsylvania Department of Transportation website

The research team found the most pertinent information under the Bureau of State Employment Job Postings on the Pennsylvania Department of Transportation website. This yielded content on available jobs for maintenance crew related positions. It did not list any information on highway maintenance workers' career path but did list salary information on individual job postings.

Turner, John S. *The Pearl Harbor fleet maintenance pilot program: conversion from the Navy working capital fund to appropriated funding. Diss. Monterey, California. Naval Postgraduate School. Monterey, CA. 2002.*

The research team found this dissertation by doing an online search for Navy consolidation efforts. This article yielded comprehensive information on the background of the Navy's Pearl Harbor Pilot, why they decided to undertake it, the challenges involved in maintenance facility consolidation and the benefits it yielded.

White, James R. *The Pearl Harbor Naval Shipyard and Intermediate Maintenance Facility Consolidation: A Review of Performance Measures. Naval postgraduate school. Monterey, CA. 1998.*

This article, that the research team also found through an online search, provided information on performance metrics that can be used to measure if a consolidation was a success or failure.

Peer Reviewed Agencies

As part of this analysis, CS conducted a review of the highway maintenance crews, highway maintenance worker titles and consolidation efforts of these worker titles and policies and procedures of other transportation agencies and federal entities (including DOTs). Agencies reviewed included:

- New Jersey Department of Transportation (NJDOT)
- California Department of Transportation (Caltrans)
- Delaware Department of Transportation (DelDOT)
- Illinois Department of Transportation (IDOT)
- Michigan Department of Transportation (MDOT)
- New York State Department of Transportation (NYSDOT)
- Pennsylvania Department of Transportation (PennDOT)

These agencies were selected because they represent a comprehensive look at highway maintenance crews and their worker titles, while touching upon specific

elements that are similar to or would enhance NJDOT's highway maintenance worker title consolidation plan.

The research team also conducted an interview program to supplement any informational gaps in the literature review and the survey they conducted. The interview program also served to gain a more comprehensive understanding of NJDOT's peer agency highway maintenance crew structure and worker titles. The research team interviewed the California Department of Transportation (Caltrans), the Delaware Department of Transportation (DelDOT), the Illinois Department of Transportation (IDOT), the Michigan Department of Transportation (MDOT) and the New York State Department of Transportation (NYSDOT).

The research team conducted thorough interviews and discovered that each DOT approaches highway maintenance crew structure and (potential) worker title consolidation in a different way and that there is no one-size fits all approach. For example, IDOT only has one level of Highway Maintainer, with different salary steps depending on experience, while all of NYSDOT's highway maintenance crews have levels 1 and 2, from Highway Maintenance Worker 1 and 2 to Bridge Repair Supervisor 1 and 2. A summary of the various approaches to highway maintenance crews and worker titles is detailed below.

Agency Overview

All highway maintenance crews are housed in the state's Department of Transportation. What varies between the states is what department, bureau, or entity the highway maintenance crews fall under. There are also differences between these states and whether or not they are civil service states and which positions are filled by the civil service department and which aren't (Some of Pennsylvania's highway maintenance crew positions are overseen by the Civil Service Commission and the remainders are overseen by the Bureau of State Employment).

Each state divides their DOT jurisdiction into regions, and predictably, larger states have more regions than do smaller states. Some states integrate their central headquarters into a region, like New Jersey, and other states separate their central headquarters and do not include it in the regional count, like Pennsylvania. In addition to regions, highway maintenance crews' union status shapes operations of these departments and entities. The highway maintenance crews' relationship with unions is not always readily available, but most, if not all, state crews are unionized.

California Department of Transportation (Caltrans)

Caltrans is governed by Civil Service and its highway maintenance workers are unionized. They have 27 supervisory titles and 42 non-supervisory titles, which makes it the largest of the DOTs interviewed. Maintenance worker pay is negotiated through the union, while new maintenance workers are recruited through an online examination via California's job website. This aspect is challenging because thousands of candidates are on the list, though only those with the requirements will be hired. For the state of

California, all hires are required to meet the minimum qualification of their particular classification. The majority of hires qualify, but if for some reason they were hired without meeting the minimum qualifications, then the hire would be considered unlawful and could be terminated.

Certain personnel who are seeking advancement opportunities must take an examination for this process, including the following titles: Leadworker, Supervisor, Superintendent, Manager I and Manager II. Similarly, when considering promotions, Caltrans prioritizes merit over seniority.

Delaware Department of Transportation (DelDOT)

DelDOT is the smallest of all states researched, with only three counties and four districts. This size is reflected in the fact that they only have 1,950 employees in their entire Department of Transportation and only have one Trainer for their Division of Maintenance and Operations. Their crews are unionized but they do not utilize the civil service commission to fill their positions. They made a consolidation effort in 2002, underwent challenges in doing so, but decided to keep their new titles.

Their highway maintenance crews have three non-supervisory titles, Equipment Operator I to III, compared to six supervisory titles, Equipment Operator IV to District Maintenance Superintendent. The Equipment Operator I position is an entry-level training position, where employees either get promoted or move on. DelDOT encourages their employees to train in as many equipment certifications as they wish, which enables them to fill approximately 90% of their supervisory positions internally, as their employees gain experience and training on the job. Employees who do not wish to stay in highway maintenance crews can segue into Engineering, Planning and Surveying. For their entry-level Equipment Operator I positions, DelDOT recruits at area high schools and technical schools, as well as posts online.

Illinois Department of Transportation (IDOT)

IDOT has several thousand employees in Maintenance Operations. Illinois is divided into five regions and nine total districts. Unlike some of the other DOTs interviewed, Illinois did consolidate some of its highway maintenance worker titles; they moved Power Shovel Operators under the purview of Highway Maintainers. They consolidated several hundred Power Shovel Operators until their Highway Maintainers series through attrition, over the course of two years. Their Power Shovel Operators were not functioning efficiently, as they could only work on one type of machine and would be with the crew for the entire day, regardless of the scope of work being done.

The Highway Maintainers have two supervisory positions: Leadworker and Lead Leadworker, who report to Operations Superintendents 1 & 2. Rather unique among NJDOT's peer agencies, IDOT Highway Maintainers do not have different levels or salary steps. This is unusual, as most highway maintenance positions have at least a 1 and 2 level. Regarding their career path, they can segue into the Leadworker position if

a vacancy opens up; promotions are based on the interview, not a proficiency exam or employment record.

Michigan Department of Transportation (MDOT)

MDOT has 2,500 permanent employees and 1,500 to 2,000 employees in Highway Operations. Highway Operations is composed of seven regions , but does not maintain the International Bridge, Blue Otter Bridge, or Mackinac Bridge, which are maintained by their own crews. Each MDOT region has its own office, a few garages and approximately three Transportation Service Centers.

Regarding personnel breakdown, each garage has its own Transportation Maintenance Supervisor, who oversees 15 to 20 personnel. Transportation Maintenance Supervisors report to Engineer Managers, three or four of whom are assigned to a region. Engineer Managers report to Regional Engineers, of whom there are one per region.

The highway maintenance workers are titles Transportation Maintenance Workers, levels 6 to E8, with 6 being an entry level. Typically these entry level employees get promoted or terminated within one year. Rather unique to MDOT is that a Transportation Maintenance Worker 6 can start at a higher salary step if he or she can prove a higher previous salary with a pay stub. Similar to other DOTs, Transportation Maintenance Workers encompass specialty crews, including signs and striping, smaller bridges and landscaping and pesticides.

The career path after a Transportation Maintenance Worker E8 is a Transportation Maintenance Worker 9, then Transportation Maintenance Worker 11, and Transportation Maintenance supervisor. Regarding recruiting, Highway Operators can hire whomever, so long as they meet Michigan Civil Service requirements. They also have veteran preference but are not restricted from hiring a non-veteran if they desire.

New York State Department of Transportation (NYSDOT)

NYSDOT is relatively large, with 11 regions, and between 7,000 and 8,000 DOT employees. Their highway maintenance crews are unionized and operate under the civil service system. NYSDOT has not made any efforts to consolidate their worker titles, which stands at 17 positions (including multiple steps of the same position). Of these 17, ten are non-supervisory positions and seven are supervisory.

NYSDOT has a large training component to their highway maintenance crews. The entire DOT employs 60 to 70 Equipment Operator Instructors across the state, so four to five Equipment Operator Instructors train in each region. They train on three classifications of equipment, from Category 1 to Category 3, with three being the heaviest and most advanced equipment. All Equipment Operator Instructors can train on all equipment, while some are more comfortable on certain pieces than others, like under-bridge equipment, for example. As training is important to advancement, the union plays an integral role to ensure favoritism does not play a role.

Employees are encouraged to train on equipment outside of their job description and this certification does not go away, though an employee will need to refresh it if he or she hasn't worked on the equipment for a year. This plays into filling vacancies and recruiting new employees. Applications are accepted throughout the year, but new employees are not brought on during the winter months.

Pennsylvania Department of Transportation (PennDOT)

Out of the aforementioned agencies, PennDOT's information is the most lacking because they did not complete the research team's survey nor agree to an interview. The information is only based on the research team's literature review. PennDOT's six divisions are called deputates, of which Highway Administration is the largest. Others include Safety Administration, Planning, Aviation and Rail Freight, Local and Area Transportation, and Administration.

The central headquarters is located in Harrisburg and there are 11 remaining Engineering Districts. Each of the 11 districts has a Maintenance Division, which is responsible for repairing and maintaining roadways. The Pennsylvania Civil Service Commission covers some of the positions that comprise highway maintenance crews. These crews specialize in Sign Crews, Bridge Crews, Seal Coat Crews, Surface Treatment Crews, General Maintenance Crews. Within these crews, example positions include: Diesel and Construction Equipment Mechanics, Transportation Equipment Operators, Equipment Operator A, Equipment Operator B, Highway Maintenance Manager I, Assistant Highway Maintenance Manager.

SUMMARY OF WORK PERFORMED

At the direction of NJDOT, the research team investigated the various structures and positions of highway maintenance crews in California, Delaware, Illinois, Michigan, New York, New Jersey and Pennsylvania DOTs. This investigation included web-based research, the administering of a survey (please see Appendix A) to the aforementioned state DOTs and interviews conducted with Caltrans, DelDOT, IDOT, MDOT and NYSDOT. All three of these sources gave the research team a holistic view into how each state DOT manages its highway maintenance crew. Specific work efforts included:

- Literature Review and Research Process: Examined existing highway maintenance crew structure and best practices for consolidating worker titles based upon other state DOTs efforts;
- Peer Review – Collected and evaluated NJDOT's existing highway maintenance crews, worker titles and relevant policies and procedures and compared these against peer agencies;
- Survey program – drafted survey questions based on research, created an online survey to administer to participating agencies online, disseminated it and received responses;

- Interview Program – Developed and conducted interviews with other DOT's to augment and corroborate information gathered from the literature review and survey;
- Report on the findings from the interview program, survey, existing policies and procedures review and literature review; and provide recommendations to NJDOT to improve future highway maintenance worker title consolidation.

Literature Review

To determine policies and procedures appropriate for NJDOT highway maintenance worker title consolidation, it was necessary for the research team to review peer agencies' (including DOTs) previous consolidation efforts. By analyzing best practices and peer approaches to title consolidation, the research team was able to identify notable elements and supplemental materials that would enhance NJDOT's future highway maintenance worker title consolidation efforts. The research team was also able to identify necessary structural elements for consideration when NJDOT engages in its future consolidation Plan.

Part of this review involved making state fact sheets, worker fact sheets and a state and worker matrix. Please see Appendix B for all of the states' fact sheets, Appendix C for the worker fact sheets and Appendix D for the Matrix. It is worth noting that, unlike other projects that Cambridge Systematics has conducted for NJDOT, this project's literature review is surpassed in importance by the survey and interview program. However, the literature review revealed that NJDOT's highway maintenance worker title consolidation efforts could be enhanced through further investigation into the following elements:

- Additional state DOTs that have conducted highway maintenance worker title consolidation efforts, their experiences, perceived successes and failures.

Peer Review

Worker fact sheets

To determine the policies and procedures appropriate for inclusion in NJDOT's future highway maintenance worker title consolidation plan, it was necessary for the research team to evaluate NJDOT's, and other state DOTs, existing highway maintenance worker and crew structure, hiring policies, training and career path policies and procedures. This evaluation, which was illustrated through NJDOT and other state DOT fact sheets, helped the research team to identify strengths and weaknesses of the respective DOTs and their existing highway maintenance workers and crews. These fact sheets also enabled the research team to make more meaningful recommendations and conclusions to NJDOT regarding their future consolidation efforts. The research team gathered and reviewed the following highway maintenance worker and crew aspects:

- *Worker title definition*: This was a job description for worker fact sheet being drafted
- *Employment requirements*: These were general requirements necessary for an applicant to be hired for this position
 - *Experience*: This examined the required employment experience necessary for an applicant to be hired for this position
 - *Licensing/ certification*: This detailed the required license or certifications necessary for an applicant to be hired for this position
- *Salary range*: This described the salary range of the worker title being outlined
- *Organizational hierarchy*: This examined the organizational hierarchy of that state DOT
- *Knowledge and abilities*: the knowledge and abilities that this position requires
- *Additional desirable qualifications*: If there were additional qualifications that were not required, but were desired, like a particular license endorsement
- *Examples of work*: Examples of projects and duties that this worker could expect on the job
- *Career Ladder / Promotional pathways*: What advancement opportunities this worker could be eligible for
- *Hiring process*: What a potential worker could expect in the hiring process; included elements like drug tests, proficiency exams, etc.
- *Miscellaneous*: This outlined anything else pertinent to this position, such as union requirements

State fact sheets

The worker fact sheets outlined information on specific workers, as relevant to highway maintenance crews. The state fact sheets (Appendix B) outline more macro-level information that pertains to a specific state's DOT and department where highway maintenance crews are housed. These fact sheets allowed the research team to quickly take note of organizational differences between New Jersey and New Jersey's peer DOTs. The state fact sheets outline the following information (which is not elaborate enough to warrant a bulleted list): agency overview, the state's civil service status, a list of maintenance worker titles, recruitment and training information regarding that state's highway maintenance crews. Depending on the availability of information, a state's fact sheet may also list information on previous worker consolidation efforts and workers' career path.

Matrix

The research team used both the worker fact sheets and state fact sheets to complete the Matrix (Appendix D) The matrix offers a quick reference guide between New Jersey and peer DOTs in two different Tabs. The “Worker Facts” tab condenses the worker fact sheets information and transposes it into matrix format; this information is straightforward and does not require an explanation. The “State Facts” tab does the same for the state fact sheets and contains the following information:

DOT regions/districts: This outlined how each state is broken-down by their DOT

Civil service: Does this state have a civil service commission?

Unionized: Are this state’s highway maintenance crews unionized?

Applicable department: Listed where highway maintenance crew was housed

Consolidation effort: Did the state conduct a consolidation effort?

State population: The state’s total population, according to the US Census, American Community Survey, 2013

Total state revenue: The state’s total revenue, according to the US Census, American Community Survey, 2012

State expenditures on highways: What the state spent on highways, according to the US Census, American Community Survey, 2012

Percent of total state revenue spent on highways: A percentage derived from “State expenditures on highways” divided by “Total state revenue”

DOT budget: Each state DOT’s budget, according to sources listed in the “Sources (budgets)” tab

DOT budget (in billions): Each state DOT’s budget transposed into billions of dollars

Total state revenue (in billions): The aforementioned field, obtained from the US Census, American Community Survey, 2012, transposed into billions of dollars

Percentage of state budget for DOT: Computation derived by dividing DOT budget (in billions) by Total state revenue (in billions)

Survey Program

Because the existing information on highway maintenance worker title consolidation was not abundant nor readily available on state DOT websites, the research team conducted a survey program to close informational gaps. The research team drafted the most relevant questions possible based on the information gathered from the literature review; they also drafted questions based on what information most needed to be

gathered. The research team then collaborated with NJDOT to revise the survey questions and developed an online survey tool so that those surveyed could respond in a convenient manner.

Interview Program

To supplement and augment the information gathered from the literature review and the survey program, the research team conducted interviews with other DOTs, with NJDOT and the New Jersey Civil Service Commission participating in the conference calls. The purpose of the interview program was to determine how these organizations: conducted previous consolidation efforts; structured, trained and recruited their highway maintenance staff; provided advancement opportunities to their highway maintenance crews; were structured on a statewide DOT level. Because NJDOT had different questions for each peer agency, based on the survey responses, they focused on different points for each interviewee.

The research team worked with NJDOT staff to develop an interview guide and cover letter, which was emailed to all survey respondents and interviewees prior to the interviews. More specific than the aforementioned topics, the interviews addressed the following topics: state civil service governance, how consolidations efforts were conducted (if they were), how the agency was organized, the number of supervisory and non-supervisory titles, maintenance crew composition, job descriptions and other specific information. The survey, which the interview is based off of, is in Appendix A. Each interview, conducted as a conference call, was recorded with detailed minutes, available in Appendix E.

Research Findings

California Department of Transportation (Caltrans)

NJDOT interviewed Caltrans on December 12th, 2014. The following agencies participated in the call: Caltrans, NJDOT, New Jersey Civil Service Commission and Cambridge Systematics. NJDOT covered a wide array of topics in the interview, including recruitment, hiring, hiring restrictions, certification requirements, career path and training practices, but focused heavily on crew composition, specialty positions and responsibilities, the supervisory structure and supervisory responsibilities.

Caltrans findings offer examples of advantageous and disadvantageous practices, as well as ones that offer a mix of benefits and hindrances. A practice that could be a hindrance to NJDOT if implemented is that Caltrans specialty workers, such as landscapers, painters, and electricians, have specialty supervisors and superintendents. NJDOT is trying to minimize specialty positions, not add specialty supervisors and superintendents into the existing structure.

A number of Caltrans practices, all related to hiring and recruitment, that may be beneficial for NJDOT to emulate include: requiring an online exam even for entry level positions; the placement of applicants into separate ranks based on their application

and exam; the administering of a statewide Caltrans Supervisor Maintenance exam on one day a year that yields a promotional list for the department. These three findings are predicated on the fact that Caltrans' highway maintenance positions are competitive and they have a broad applicant pool. For example, it may be difficult for NJDOT to implement an entry-level online application exam if this reduces applicant numbers to an unsustainable degree.

Two of Caltrans' practices are beneficial and disadvantageous to either the agency, or the employees. The "post & bid" process is one of these. A Caltrans employee can bid on a job posting anywhere in the state, and if all applicants possess the same qualifications, the employee with the most seniority gets the position. This is good for the employees, as it gives them freedom to easily relocate to a more desirable location, but this may be bad for Caltrans, as it promotes seniority over competency, and may create an imbalance in staffing and induce a high employee turnover in less desirable locations.

The second practice with mixed consequences is that salaries for identical positions are flat across the state, regardless of cost of living. This may hinder the employee, depending on where he or she is living, but may benefit Caltrans as being a simple salary structure. It is important to note that this flat, statewide salary structure may act as a balance to the post & bid system, where employees could potentially live somewhere more desirable and earn a higher income once there (they would currently maintain the same income if relocated to somewhere more desirable).

Delaware Department of Transportation (DelDOT)

NJDOT interviewed DelDOT on November 21st, 2014. The following agencies participated in the call: DelDOT, NJDOT, New Jersey Civil Service Commission and Cambridge Systematics. NJDOT covered a wide array of topics in the interview, including hiring, recruitment, career path, training, certification, crew structure, and salaries, but focused heavily on the supervisory structure, supervisory responsibilities and chain of command.

DelDOT is doing a number of things that may benefit NJDOT to emulate. First, DelDOT's worker structure is logical: entry level workers are called Equipment Operators (EO) I, who can then advance to levels II, III and IV. But this system is than simply logical in name; Equipment Operator IIIs can start to direct crews without supervision, which makes both EO IIIs and IVs efficient and flexible. Whether or an EO III or IV supervises a crew depends on the supervision needed, the area and responsibilities. Because EO IIIs are not responsible for performance evaluations, disciplinary actions or approving leave slips, they can still have contractual leadership duties that are approved by the union.

Another successful element is the advancement opportunities. Equipment Operators or Assistant Area Supervisors can segue into the Highway Equipment Superintendent position, even though this position is in a different series. Likewise, EOs can transfer to

the Physical Plant Trades & Mechanics series or Engineering, Planning and Surveying series. This encourages talented workers to stay in DelDOT instead of seek external opportunities. Another policy that encourages employee retention is that every EO I can become an EO III with the proper training, but is not coerced into doing so. Because of that, approximately 90% of highway maintenance crew supervisors haven risen internally.

Illinois Department of Transportation (IDOT)

NJDOT interviewed IDOT on November 26th, 2014. The following agencies participated in the call: IDOT, NJDOT, New Jersey Civil Service Commission and Cambridge Systematics. NJDOT covered a wide array of topics in the interview, including IDOT's highway maintenance structure, supervisory composition, career path, structures of titles, crew responsibilities, hiring, recruitment, licensing, and union restrictions, but focused heavily on IDOT's own consolidation efforts, these challenges, opportunities and outcomes.

IDOT has done a number of things that may serve as examples for NJDOT. IDOT conducted its consolidation efforts with one title, and this may act as a pilot consolidation effort that allows NJDOT to streamline and improve its consolidation plan over a period of time. IDOT replaced several hundred Power Shovel Operators (PSO) with Highway Maintainers, through attrition. Their consolidation took two years.

IDOT's consolidation also revealed that diction is important, especially when working with unions and public-sector employees; stating "position elimination" may incite a backlash and recommend stating "position restructuring."

While internal advancement is commonplace in highway maintenance crews, IDOT's policy that a Lead Worker must have been a Highway Maintainer may incentivize employees to focus on internal, instead of external opportunities; this policy may reduce the employee turnover rate. Regarding highway maintenance crew structure, another practice that NJDOT may find beneficial is to have specialized crews within the highway maintenance series. For example, IDOT's Highway Maintainers also do pesticide spraying, instead of this being done by a separate position. A Landscape Engineer simply sets up a training and will certify a Highway Maintainer. Bridge crews and Sign crews are still Highway Maintainers.

Michigan Department of Transportation (MDOT)

NJDOT interviewed MDOT on November 24th, 2014. The following agencies participated in the call: MDOT, NJDOT, New Jersey Civil Service Commission and Cambridge Systematics. NJDOT covered a wide array of topics in the interview, including MDOT's structure, highway maintenance crews' career path, trainings, evaluations, crew composition, specialized positions and licensing, but focused heavily on supervisory structure, supervisory roles, hiring, recruitment, and highway maintenance crews' salaries.

Some DOTs offer practices that may be worth emulating, but it is also important to cite practices that may be illogical or hinder an agency's efficiency. MDOT titles their Transportation Maintenance Workers (TMW) as TMW 6 to E8, with more supervisory roles following a TMW E8. While it is a small point that does not deserve elaboration, these worker titles are illogical and do not streamline the agency. As an entry-level position, it would be more logical and less confusing to title the position TMW I instead of TMW 6. Likewise, TMW E8 has the distinction of possessing quasi-supervisory duties, but a more logical title could denote this.

Another practice that may hinder MDOT and offer a lesson to NJDOT is that only TMW 9s can advance to the Transportation Maintenance Supervisor (TMS) 11 position. A strict career path and hiring of internal candidates is beneficial to the agency, but in this particular case, a dearth of TMW 9s means that some qualified TMS E8s are being hindered. This example is not applicable to all positions, only ones that do not have many workers. In general, career trajectories and internal hiring practices are beneficial.

MDOT has a number of practices which are worth emulating, if NJDOT is not already practicing them. Their policy, which is common among DOTs interviewed, is that their TMW 6 position is treated as an apprenticeship, where employees are either advanced or terminated. This ensures that employees are good fits for the position. Another finding is that MDOT hires Work Element Coordinators, who are qualified to train and evaluate employees, as are their supervisors. Granting multiple individuals the ability to train and evaluate gives the department flexibility and streamlines the training and advancement process.

Additional findings may be beneficial to NJDOT: requiring employees to complete work elements (certifications) in order to advance incentivizes employees and ensures they are properly trained in multiple pieces of equipment and procedures; salary steps are uniform but a TMW can come in at a higher salary with the proper work experience and pay stubs. This incentivizes qualified employees to consider MDOT a viable work alternative that they might not have otherwise considered. Lastly, MDOT is phasing out TMS 13 positions, which are identical in duties as TMS 11 positions. This eliminates one additional level of complication for existing MDOT staff and those external to MDOT.

New York State Department of Transportation (NYSDOT)

NJDOT interviewed NYSDOT on November 7th, 2014. The following agencies participated in the call: NYSDOT, NJDOT, New Jersey Civil Service Commission and Cambridge Systematics. NJDOT covered a wide array of topics in the interview, including NYSDOT structure, crew composition, crew leadership, evaluations, licensing, recruitment, and career path, but focused heavily on worker title differentiations, training, specialized worker titles and specialized crews.

NYSDOT is following many practices that benefit its highway maintenance crews: they have two Highway Maintenance Supervisors (I & II) that can cover for each other in the event of absence; they have four or five dedicated trainers per region to facilitate trainings and evaluations; each employee can have up to five requests for equipment at any given time,

after meeting the minimum qualifications, and this applies to all equipment, not just the equipment that the worker is currently expected to use. This may be NYSDOT's most beneficial practice, as it encourages ambitious workers to gain additional skills and advance their careers. This may result in a larger body of more skilled workers that choose to stay with NYSDOT, for its advancement opportunities, instead of seeking external opportunities. NYSDOT engages additional beneficial practices, which include: maintenance crew certifications are permanent, though employees must be recertified after one year without using said equipment. However, a supervisor can also challenge an employee's questionable use of equipment and strip him or her of a certification if deemed unsafe, or an accident occurs. Certification striping must be reviewed and approved by a committee. Lastly, NYSDOT encourages employee advancement, which yields approximately a 99% rate of supervisors who have risen through the highway maintenance crew.

United States Navy maintenance facility consolidation effort

In 1999 the Navy undertook a consolidation effort of two maintenance facilities, the Naval Shipyard and the Intermediate Maintenance Facility at Pearl Harbor.¹ This effort was called the Pearl Harbor Fleet Maintenance Pilot Program and sought to consolidate management, operations, personnel and funding of these two facilities. Chief of Naval Operations, Admiral Frank Kelso wanted to achieve the following three objectives: increase efficiency by consolidating intermediate-level maintenance activities; have Fleet commanders integrate intermediate and depot-level maintenance activities with management; perform fleet maintenance with a single process.

The Navy encountered various challenges with this consolidation. The Naval Shipyard and Intermediate Maintenance Facility had fundamental differences in their nature of work, employees and financing. It was also difficult to consolidate two facilities that used different, complex information management systems that affected how their respective financial transactions were processed. Overall, the Pearl Harbor Fleet Maintenance Pilot Program dealt with the transformation of several thousand jobs, and "All personnel, from the commander down to the newest laborer, had to understand the changes that impacted their everyday operations."²

Though challenging, these efforts yielded benefits. In general, the Pearl Harbor Pilot created more efficient personnel, facilities and equipment management. More specifically, consolidating over 4,000 workers from two separate facilities made it easier to assign workers to maintenance projects. Additionally: reducing the number of buildings and equipment in the maintenance complex enabled the Navy to reduce its facilities and equipment footprint; labor rates stabilized; the cost per unit of output decreased over thirteen dollars per hour during fiscal years 1999 and 2000; improved

¹ Turner, John S. *The Pearl Harbor Fleet Maintenance Pilot Program: Conversion From the Navy Working Capital Fund to Appropriated Funding*. Diss. Monterey, California. Naval Postgraduate School. Monterey, CA. 2002.

² Ibid

production efficiency and resource utilization were reflected in the fact that the total labor hours expected to run a maintenance shop decreased; the Shipyard's backlog of Consolidated Ship's Maintenance Plan work items decreased; overall improvements in schedule adherence.³

Another ancillary benefit of the Pearl Harbor Project was the enumeration of eight metrics that could be used to measure if a consolidation effort was a success or failure.⁴ These included: cost per unit of output; quality; production efficiency and resource utilization; Consolidated Ship's Maintenance Project backlog; schedule adherence; total asset turnover; days worked ratio; revenue/cost per employee. NJDOT may consider the above performance measures when evaluating its maintenance titles consolidation effort.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The research team concluded that NJDOT should consider consolidating highway maintenance worker titles because the current titles are antiquated and restrict worker and crew efficiency by limiting the scope of their duties. A redesigned worker title group could make highway maintenance crews more flexible and efficient, as well as offer a clearer understanding for advancement. More specifically, NJDOT could potentially see the following benefits from worker title redesign:

- More efficient crews because workers can perform a greater breadth of tasks.
- More flexible crews, if certain positions have partial supervisory roles and if specialized positions are housed within the Highway Maintenance series.
- Increased advancement opportunities, with proper training incentives (for example, each NYSDOT highway maintenance crew employee can have up to five requests for equipment that he or she wishes to train on, after meeting the minimum qualifications. This applies to the entire equipment fleet, not just a piece of equipment required for the employee's duties.) and advancement transparency.
- Greater training and education retention, if training policies include an ongoing show of competency.
- Greater employee competency, if evaluations and advancement emphasize worker skills and knowledge over rank and seniority.

³ Ibid

⁴ White, James R. *The Pearl Harbor Naval Shipyard and Intermediate Maintenance Facility Consolidation: A Review of Performance Measures*. Naval postgraduate school. Monterey, CA. 1998.

- Streamlined and standardized trainings and evaluations, if a team of dedicated trainers can exclusively perform these duties statewide.
- A more efficient application process if all applicants, including entry-level, must complete an online exam (For example, Caltrans requires online assessments for all applicants).
- Less confusion inside and outside of the agency if worker titles and progression are more logical.

The research team discovered a number of opportunities and challenges to highway maintenance worker title consolidation. A redesign plan presents the following opportunities: to make workers and crews more flexible and efficient; to improve employee retention, competency and satisfaction; to streamline and standardize trainings and evaluations; to improve the hiring and recruitment process; to clarify the grouping of employee titles that may be confusing to those inside of and outside of NJDOT. While there are numerous opportunities to a worker title redesign plan, many challenges also exist, which include: the complexity and extended duration of consolidating more than one worker title at once; possible public and union backlash to the perception that title consolidation means job elimination.

General conclusions to a highway maintenance worker title consolidation are as follows:

- Consolidating more than one title simultaneously may be unduly challenging without having conducted a pilot consolidation.
- It is advantageous to assess and amend other, relevant policies and procedures in tandem with worker title consolidation, such as: trainings and evaluations, career path and advancement, recruitment and hiring.
- In order to maximize crew efficiency and flexibility: workers should have varied job descriptions with language that encompasses unforeseen duties; specialty crews should be housed within the highway maintenance series, with generalized, not specialized supervisors; the worker title directly below a supervisor should include partial supervisory duties, so that if the supervisor is not available operations can continue seamlessly
- In regards to advancement opportunities, prioritizing seniority and rank over skills and knowledge may reduce worker ambition and motivation to exceed expectations (Union stipulations may make this difficult or impossible to amend.)

Recommendations

NJDOT should consider examining in greater detail opportunities to restructure their highway maintenance worker titles because different changes may achieve different objectives. For example, making crews more flexible and efficient will increase productivity and reduce costs; improving recruitment and hiring techniques will reduce

the resources spent on this process; increasing employee retention will reduce resources spent on the hiring and recruitment process and increase worker productivity by keeping their skills and knowledge in the highway maintenance crews; streamlining trainings and evaluations will reduce the time spent on these endeavors; standardizing trainings and evaluations will ensure that all workers are receiving the same information across the state; increasing advancement transparency will improve worker satisfaction and motivation.

However, successfully achieving these objectives requires a systematic process and approach. The research team recommends that NJDOT do the following to create a sound process that will achieve these results:

- Draft a concept plan (an example is provided in Appendix F) that outlines any necessary changes to worker titles, their job descriptions, and changes to the following policies and procedures: career path and advancement, hiring and recruitment, training and evaluation.
- Develop a pilot plan for title consolidation before attempting simultaneous consolidations of other titles. This will provide NJDOT with valuable lessons about how to best approach a worker title consolidation and redesign plan and will reveal what changes were advantageous and disadvantageous. For example, IDOT treated one title consolidation as a pilot and learning process. The Illinois DOT created a new Highway Maintainer position and replaced hundreds of Power Shovel Operators through attrition over a two year period.
- Implement remaining redesign plan for consolidation of highway maintenance worker titles from nine positions to four or five positions (For example, possible redesigned titles could be: Maintenance Worker 1, Maintenance Worker 2, Maintenance Worker 3, Maintenance Worker 4, Maintenance Worker 5).

NJDOT has many elements to consider amending in their highway maintenance worker title redesign, including worker skills, education, career path, licensing, and crew structure. They may also consider amending more macro elements, like the mechanisms that are necessary to the consolidation process. Certain mechanisms may be advantageous or disadvantageous to NJDOT's consolidation efforts. The following recommendations either encourage or discourage positive or negative outcomes, respectively, for the redesign efforts:

- Establish a feedback system that will provide NJDOT with information on elements of its consolidation efforts that are successful or need to be amended;
- Make advancement and training processes transparent, so that employees are as informed as possible and can act on advancement and training opportunities as they see fit;
- Grant highway maintenance workers the ability to segue into positions in other NJDOT series, as this may increase employee retention due to a greater

abundance of employment opportunities; no position should lack advancement opportunities;

- Build an advancement schema that enables any maintenance worker title to be eligible to rise to a supervisory role;
- Ensure that the consolidation of highway maintenance titles does not result in the decrease of any one title's salary rank;
- Offer training on equipment beyond that which employees use for their current jobs; this may induce a more highly-trained workforce and may reveal more ambitious employees;
- Require an online exam for all applicants; this will act as a screening tool and may reduce the resources used to narrow the applicant pool;
- Implement proficiency assessments for any potential promotion, as this will emphasize skills over seniority. As a counter example, for an IDOT Highway Maintainer to become a Lead Worker there is no proficiency assessment or consideration of past performance. This promotes seniority over competency and does not incentivize workers to perform at their peak;
- Broaden the advancement requirements, for more senior positions; this will widen the pool of workers to draw from and may induce workers to exceed expectations. For example, MDOT Transportation Maintenance Worker 9's are the only employees eligible to advance to a Transportation Maintenance Supervisor 11; this hinders both Transportation Maintenance Worker E8's, and the overall advancement process, because there is a dearth of Transportation Maintenance Worker 9's to draw from;
- Include specialized skills in the highway maintenance series, but ensure that their titles and supervisors are generalized; specialized supervisors will decrease crew flexibility and efficiency. As a counter example, Caltrans specialty maintenance workers (Landscaper, Painter, Electrician, etc.) are part of the highway maintenance crew, but have their own specialty supervisors and superintendents; a Caltrans Electrical Superintendent oversees four to six electrical crews. NJDOT is seeking to make crews and their supervision less, not more, specialized;
- Create a dedicated group of trainers who exclusively conduct trainings. This will accelerate these processes and standardize trainings across the state. For example, NYSDOT has four or five dedicated trainers per region, which makes training uniform, consistent and efficient across all 11 regions.