Bridge Hour Definition and Methodology Study

Updated Draft

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Prepared for:
U.S. Coast Guard
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PREFACE

This Updated Draft of the report is being presented to stakeholders and interested public members requesting comments. Comments will be provided directly back to MicroSystems Integration, Inc. (MSI) within the review period. Comments can be provided in any form (e-mail, letter, scanned notes) and will not be considered an official position of the entity providing the comments. Receiving comments early will provide MSI the greatest opportunity to further investigate and adjust the report as necessary. MSI will not share comments received with the public. MSI will consider and reconcile comments and feedback received into a final report that will be presented to the GLPAC at a date to be determined later in the summer.

An initial draft of this report was presented to the GLPAC on 11 February 2013, followed by focus groups representing pilot stakeholders and industry stakeholders. Over 100 comments were recorded during those sessions. Following the focus groups, additional comments were received from the Canadian shipping industry stakeholders and from the Western Great Lakes Pilot Association. Each comment recorded was reconciled and considered for inclusion in this version of the report.

This Updated Draft has been enhanced and restructured based on continued analysis and stakeholder feedback to amplify findings and clarify the presentation of concepts. Specifically, the overall presentation of Recommendations has been reorganized around the categories of identified System Issues.

The purpose of the Bridge Hour Definition and Methodology Study is to inform the Great Lakes pilotage ratemaking process. Any decisions on recommendations contained within this report will be vetted by the Coast Guard and must follow the appropriate review and decision-making processes.

The review should focus on the recommendations and methodologies presented. To illustrate implementation of the recommendations, example calculations are provided. These calculations are based on data in the Klein system from 2008 to 2011. It is recognized this data may not be accurate or complete; therefore, the example calculations are presented to illustrate the recommendations and provide a general sense of the impact on the ratemaking process. When recommendations are selected and implemented, accurate and up-to-date data from the Klein system should be used in the calculations.

Your comments on the recommendations, the methodologies presented, and inconsistencies in the information should be the primary focus. Comments on accuracy of data are welcome, but keep in mind that a significant recommendation is that completeness and accuracy of data in the Klein system be improved to provide a consistent and accurate operational data repository.

EXECUTIVE SUMMARY

MicroSystems Integration, Inc. (MSI) was tasked to conduct a review and analysis of the ratemaking process for the U.S. Great Lakes pilotage services. The purpose of the study was to develop a series of recommended methodologies for consideration by the Coast Guard, with rationale for those recommendations supported by analysis. Specific areas of the ratemaking process outlined in Appendix A of 46 CFR 404 were identified:

- Update the existing bridge hour definition.
- Establish a seasonal work standard for pilots.
- Evaluate staffing levels.
- Evaluate the efficacy of the current billing scheme.
- Assess the standard for calculating target return on investment (ROI).
- Review the appropriate benchmark for estimating pilot compensation (including target compensation versus actual compensation).

Each of these areas contributes in varying degree to the overall process to establish rates. A structured analysis was carried out where alternatives within each of these specific areas were assessed against a set of criteria to ensure the safety, efficiency, and cost of providing pilot services on the Great Lakes and improvements to the ratemaking process. The criteria used in each of these assessment categories are provided in **Table ES-1: Recommendation Criteria.**

Table ES-1: Recommendation Criteria

Safety	Efficiency/Reliability	Cost	Ratemaking Process
• Fatigue Standards • Managed Operating Risk • Reasonable Workload • Qualified and Experienced Pilots • Currency and Proficiency	• Minimize Delay • Sufficient Pilot Capacity • Efficient Movement of Vessels	• Reasonable Rates • Stable Rates • Fair Pilot Compensation • Adequate Cost Recovery	• Stability/ Repeatability • Transparency • Simplicity • Accounts for Interdependency • Promotes Investment

From each set of alternatives, a recommendation is provided to improve stability, objectivity, and transparency of the ratemaking process. Supporting information for each of the recommendations is presented. More reliance on data from the Klein system is recommended to increase objectivity. For each recommendation, an example of the impact on the ratemaking calculation is provided to illustrate the recommendation. Improved accuracy and completeness of the Klein system data is necessary in order to implement these recommendations. The methodology and approach recommended would be exercised with the more up-to-date information available at the time of implementation. A summary of recommendations in these specific areas is provided in **Table ES-2: Summary of Specific Recommendations.**

Table ES-2: Summary of Specific Findings and Recommendations

Ratemaking Area	Recommendation(s)
Ratemaking Terminology	The term "Bridge Hour" is ambiguous and applied differently in multiple steps of the ratemaking process – some of which conflict with each other. • Clarify the terminology throughout the process, discontinuing the use of "Bridge Hour." • Convert calculations from "Hours" to "Assignments" to strengthen the coupling between demand, pilot capacity, tariffs, and revenue required.
Seasonal Work Standard for Pilots	There is no clear justification for the 1,000/1,800 hour Bridge Hour Standard. • Include the necessary and reasonable activities when determining Time on Assignment. • Base the seasonal work standard on the maximum number of assignments for each area (pilot capacity), compensating for an efficiency factor and allowing for surge.
Staffing Levels	Demand has been over-projected over the past several years. The best estimates for projected demand are recent history. • Project demand based on historical traffic demand. Use a three-year hybrid historical average to project demand. • Recommend staffing levels based on the seasonal work standard for number of pilot assignments and the projected number of pilot assignments. • Tailor the seasonal work standard efficiency factor by area to meet 90% of the previous year's demand and reduce the probability of pilots being recalled from scheduled time off.
Billing Scheme	The current billing scheme is based on multiple parameters, which are decoupled from the projected demand and revenue calculations. • Transition to a system of point-to-point standards with increased charges when transit standards are exceeded.
Target Return on Investment	The ROI calculation is misleading and does not promote investments in infrastructure and training. • Simplify the ROI calculation, and continue the use of a high-grade corporate security.
Benchmark for Pilot Compensation	Compensation on union contracts is inconsistent, and information is not readily available. • Base Pilot Compensation on negotiations between pilots and industry to establish a base year level and annual escalation for the term of the rate.

In addition to conducting the investigation and analysis of the specific parameters, system issues also were assessed and documented. These additional recommendations are broader in scope and, in some cases, step back from the mechanics of the ratemaking process to look at how effectively the objectives of the process governing the safe, reliable, and efficient delivery of pilotage services are being achieved. These additional recommendations support improvements to five problem areas summarized in **Table E-3: Summary of System Recommendations.**

Table ES-3: Summary of System Recommendations

Problem Area	Recommendation(s)
Hidden Risks	Current practices have evolved to provide more-efficient services but have introduced risks. In addition to the ratemaking terminology, seasonal work standard, and staffing levels listed above: • Mitigate the long assignments in Area 6 by assigning two pilots to long transits without a prolonged rest opportunity. • Conduct a full risk assessment, develop mitigating strategies, and determine measures to monitor risk. • Update pilot association working rules to make them clear, consistent, and reflect current practices.
Revenue Gap	Revenue generated has not reached the estimated revenue required over the past several years and has led to high levels of anxiety, impacting recruitment and retention. In addition to application of a hybrid historical average to project demand and updating the billing scheme above: • Base the projected revenue calculation on actual audit information and Klein system data rather than on the previous year's estimation. • Baseline the tariff card on a regular basis to compensate for shifts in traffic demand and patterns. • Account for the time-value of money by applying multiple years of an inflation factor to the most recently available audit information.
Ratemaking Benchmarks	Decrease subjectivity in the ratemaking process through the application of readily available and agreed-upon benchmarks. Recommended benchmarks in the ratemaking process are: • Moody's Seasoned Aaa Corporate Bond Yield for the target rate of return. • Pilot compensation based on negotiations between pilot associations and industry for a three- to five-year period with annual escalation. • The demand for the ratemaking year when calculating the hybrid historical average should be based on a percentage change based on economic indicators. Leading economic indicators for the Midwest or, if not available, national economic forecast indicators should be used.
Sustain Pilot Proficiency	Formal and structured training, recruitment, and retention programs are not visible in the ratemaking process. Recommendations to address this are: • Establish a structured training program accounting for the impacts on pilot capacity and the ability to recoup costs within reported expenses. • Evaluate recruitment and retention to identify any risk factors impeding the ability to attract and retain highly qualified individuals.
Ratemaking Management/ Governance	Recommendations to improve the objectivity, transparency, and clarity of the ratemaking process are: • Modify the rate multiplier calculation to improve the understanding and applicability. • Allow for a business risk reserve to share the risk of not meeting projected demand and promote infrastructure investment. • Adjust the ratemaking governance and review process, shifting responsibility for rate changes more toward the stakeholders and limiting the role of the Coast Guard to oversight and approval. • Consider shared services to leverage the best practices of each District. • Enhance the information in the Klein system to improve objectivity of the process.

In conducting the review and analysis, MSI researched available references and held discussions with stakeholders listed in **Table ES-4: Stakeholder Discussions Summary.** Klein system data from 2008–11[1] was used in the quantitative analysis and in the example calculations for each recommendation, with data taken from the most recent complete season (2011) used predominantly to reflect current state. Information supplied from stakeholders was used when there were gaps in the Klein system information or data was incomplete.

Table ES-4: Stakeholder Discussions Summary

Date	Organization
9/18/2012	Canadian Shipping Agents and Owners
9/19/2012	Great Lakes Pilotage Authority
9/25/2012	U.S. Great Lakes Shipping Association
10/18/2012	International Organization of Masters, Mates, and Pilots
10/18/2012	Pilot Associations Introductions at the American Pilots Association Conference
10/19/2012	Retired Shipping Federation of Canada Subject Matter Expert
10/19/2012	Lake Carriers' Association
10/24/2012	St. Lawrence Seaway Pilots Association
10/29/2012	St. Lawrence Seaway Management Corporation
10/31/2012	American Great Lakes Ports Association
10/31/2012	American Pilots Association
11/4/2012	Western Great Lakes Pilots Association
11/6/2012	Lakes Pilots Association
11/14/2012	St. Lawrence Seaway Development Corporation
11/19/2012	Canadian Laurentian Pilots Authority
12/19/2012	Associated Branch Pilots (Louisiana)
2/11/2013	Comments from GLPAC meeting
2/11/2013	Pilot Focus Group discussion and comments
2/12/2013	Industry Focus Group discussion and comments
2/20/2013	Comments from the Canadian shipping companies
3/1/2013	Comments from the Canadian shipping companies

This analysis is based on moderate growth/decline in the amount of demand for pilotage service on the Great Lakes over the next several years. If significant growth/decline is experienced, then the findings and recommendations from this report will need to be revisited.

[1] CG-WWM-2 reports that consistent use of the Klein system began in 2008.

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Key Terms

The following terms are key to understanding the analysis and recommendations presented within the report and precede the report for clarity.

Term	Definition
Bridge Hour	The number of hours a pilot is aboard a vessel providing basic pilotage service. 46 CFR 404, Appendix A, Step 2.B(1)
Bridge Hour Standard	The number of bridge hours a pilot is expected to work in one season.
Detention	"[W]henever the passage of a ship is interrupted and the services of a U.S. pilot are retained during the period of the interruption or when a U.S. pilot is detained onboard after the end of an assignment for the convenience of a ship…" 46 CFR 401.420(a)
Delay	"[W]hen the departure or movage of a ship for which a U.S. pilot has been ordered is delayed for the convenience of the ship for more than one hour after the U.S. pilot reports for duty at the designated boarding point or after the time for which the pilot is ordered, whichever is later…" 46 CFR 401.420(b)
Estimated Pilot Compensation	An estimate made by the government on annualized compensation for the Great Lakes pilots; includes both wages and benefits for the purpose of estimating rates.
Movage	"The underway movement of a vessel in navigation from or to a dock, pier, wharf, dolphins, buoys, or anchorage other than a temporary anchorage for navigational or traffic purposes in such manner as to constitute a distinct separate movement not a substantive portion of a translake movement on arrival or departure, within the geographic confines of a harbor or port complex within such harbor." 46 CFR 401.110 (a) (4)
Pilot Assignment Cycle	The collection of mandated activities to complete an assignment making the pilot unavailable for another assignment.
Pilotage Delay	A delay resulting from the unavailability of a pilot when the vessel is ready to get underway or continue underway at a pilot change point.
Projected Demand	The anticipated demand for pilotage service for the upcoming season.
Seasonal Work Standard	The amount of time a pilot is expected to be engaged in required and reasonable activities throughout the season, including time actively involved in piloting a vessel (Trip Time); travel; mandatory rest; scheduled/unscheduled time off; and delays and detentions.
Staffing Level	The number of pilots estimated to meet the projected demand.
Target Compensation	"The compensation that pilots are intended to receive for full-time employment. For pilots providing services in undesignated waters, the target pilot compensation is the average annual compensation for first mates on U.S. Great Lakes vessels. For pilots providing services in designated waters, the target pilot compensation is 150% of the average annual compensation for first mates on U.S. Great Lakes vessels." 46 CFR 404, Appendix B

Term	Definition
Time on Assignment	Necessary and reasonable time spent to execute an assignment. In the case of a cancellation, those activities completed are considered Time on Assignment. This includes: • Travel to/from a designated pilot homeport or base to the point of embarkation/debarkation • Trip Time • Delay or detention
Trip Time	The time spent aboard the vessel in the course of providing pilotage services. In the case of designated waters, it is expected the entire time providing pilotage services is spent on the bridge "direct[ing] the navigation of the vessel subject to the customary authority of the master." For undesignated waters, this is a combination of Time on Bridge and Time "Available to direct the navigation of the vessel at the discretion of and subject to the customary authority of the master." (quoted sections from 46 U.S.C. 9302(a)(1))

1. INTRODUCTION

As stipulated in the Great Lakes Pilotage Act of 1960 (46 U.S.C. 93), "each vessel of the United States operating on register and each foreign vessel shall engage a United States or Canadian registered pilot for the route being navigated who shall:

a) in waters of the Great Lakes designated by the President, direct the navigation of the vessel subject to the customary authority of the master; and

b) in waters of the Great Lakes not designated by the President, be onboard and available to direct the navigation of the vessel at the discretion of and subject to the customary authority of the master."

The Act requires the Secretary of Homeland Security to "prescribe by regulation rates and charges for pilotage services, giving consideration to the public interest and the costs of providing the services." The Secretary's duties and authority under the Act have been delegated to the U.S. Coast Guard. The Coast Guard exercises broad regulatory oversight over all aspects of Great Lakes pilotage, including the setting of pilotage rates.

MicroSystems Integration, Inc. (MSI) was tasked to conduct a review and an analysis of the ratemaking process for Great Lakes pilotage services. The purpose of the study was to develop a series of recommendations for the ratemaking process for the following specific parameters:

- Update the existing bridge hour definition.
- Establish a seasonal work standard for pilots.
- Evaluate staffing levels. Analyze the impact of utilizing a three-, five-, or seven-year rolling average to project the demand for pilotage service.
- Evaluate the efficacy of the current billing scheme.
- Assess the standard for calculating target return on investment (ROI).
- Review the appropriate benchmark for estimating pilot compensation.

Each of the above specific parameters is presented along with criteria to evaluate various alternatives. Based on an evaluation of the alternatives, a set of recommendations are provided.

MSI was also tasked to assess the overall system and relationships between areas and Districts. In the course of carrying out stakeholder discussion, supplemental discussion topics identified a recurring set of problem areas that should addressed. System problem areas were identified and observations are discussed in **Section 3: System Issues.** These system issues are part of the overall recommendations provided in **Section 4: Recommendations.**

MSI conducted a review of the existing ratemaking process, researched available related studies and public record comments on the current process, surveyed comparable industries, and met with stakeholders to develop an initial set of recommendations.

1.1 Overview

The Great Lakes pilotage system is the collection of governing processes across the entire Great Lakes inland from Snell Lock in Massena, NY. It currently comprises three Districts covered by both U.S. and Canadian pilot organizations. The Canadian Great Lakes Pilotage Authority is a

Crown Corporation providing pilotage in the waters west of Montreal, Quebec. The three U.S. pilot associations are summarized in **Table 1: U.S. Great Lakes Pilotage System Overview.**

Table 1: U.S. Great Lakes Pilotage System Overview

	District 1	District 2	District 3
Pilotage Associations	St. Lawrence Seaway Pilots' Association (SLSPA)	Lakes Pilots Association Inc. (LPA)	Western Great Lakes Pilots Association (WGLPA)
Association Type	Partnership	Corporation	Partnership
U.S. District Description	All U.S. waters of the St. Lawrence River and Lake Ontario	All U.S. waters of Lake Erie, the Detroit River, Lake St. Clair, and the St. Clair River	All U.S. waters of the St. Marys River; Sault Ste. Marie Locks; and Lakes Michigan, Huron, and Superior
Area Descriptions (D) denotes designated waters; (U) denotes undesignated waters.	Area 1 (D) – St. Lawrence River; including Snell, Eisenhower, and Iroquois Locks Area 2 (U) – Lake Ontario	Area 4 (U) –Lake Erie Area 5 (D) – Southeast Shoal to Port Huron, MI ***Note:*** Area 3 is the Welland Canal, which is serviced exclusively by the Canadian Great Lakes Pilotage Authority.	Area 6 (U) – Lakes Huron and Michigan Area 7 (D) – St. Marys River and Soo Locks Area 8 (U) – Lake Superior
Dispatch Procedures	• Dispatched through Great Lakes Pilot Association	• Dispatch watchstander 24/7 • U.S. and Canadian dispatch	• Dispatch watchstander on call; in office during the day • U.S. and Canadian dispatch
Pilot Change Points (46 CFR 401.450)	• Snell Lock • Cape Vincent • Port Weller	• Port Colborne • Detroit/ Windsor • Port Huron/ Sarnia (Buoy #12)	• Port Huron/ Sarnia (Buoy #12) • DeTour • Gros Cap (Buoy #33) • Chicago • Duluth/Superior • Fort William/ Port Arthur
Pilot Boat Services	• Cape Vincent • Cape Weller (provided by GLPA)	• Port Colborne (provided by GLPA) • Detroit River Pilot Boat • Port Huron, Michigan	• Duluth/Superior • Sault Ste. Marie, Michigan • DeTour Village, Michigan • Thunder Bay, Ontario • Port Huron, Michigan (provided by LPA)
Locks	Snell, Eisenhower, and Iroquois Locks	No locks	Soo ("Sault") Locks

	District 1	District 2	District 3
Frequented U.S. Ports	• Ogdensburg, NY • Oswego, NY • Rochester, NY	• Cleveland, OH • Toledo, OH • Detroit, MI	• Burns Harbor, IN • Chicago, IL • Milwaukee, WI • Green Bay, WI • Duluth, MN • Superior, WI
Frequented Canadian Ports	• Toronto, ON • Hamilton, ON • Port Weller, ON • Prescott, ON	• Nanticoke, ON • Windsor, ON • Sarnia, ON	• Sault Ste. Marie, ON • Thunder Bay, ON
Pilot Facilities	• Owned building (mobile home) • Owned pilot boat at Cape Vincent	• Owned building • Owned pilot boat at Port Huron • Pilot boat service at Detroit River	• Leased office space • Leased pilot boat services
Pilot "Homeports" or "Bases"	Snell Lock, Cape Vincent	Ashtabula, Cleveland, Toledo, Detroit, Port Huron	Duluth, St. Marys River, Port Huron, Chicago
Pilot Transportation	Primarily contracted service with option for pilots to drive themselves and get reimbursed	Leased/purchased vehicles driven by either pilot or contract driver (Contract driver required when vehicle needs to be staged elsewhere.)	Leased vehicles driven by either pilot or contract driver (typically pilot)
Pilot Lodging	Per diem on economy	Per diem on economy and a house located near Port Colborne	Per diem on economy
Actual Number of Pilots in 2012/Authorized	11/11	10/10	14/17
Pilot Mandatory Rest Rules	13 hours' rest after completion of any pilotage assignment (from leaving the vessel to given a new order). Short Call is with 8 hours' rest.	10 hours after standard travel time allowance to return to designated pilot base.	Per Federal Regulation 401.451, "A pilot, after completing an assignment at a change point and a series of assignments totaling more than 10 hours with no more than 2 hours rest between assignments, shall not perform pilotage services for at least 10 hours." If the pilot drives more than 3 hours, may take a half-hour rest for each hour at the destination.

	District 1	District 2	District 3
Pilot Compensation Process	K-1 based on the number of trips each month in the Lake or River pool, with association credits distributed at the end of each month.	W-2, with a base daily rate paid for each day available. Gross receipts, deducting for pilot compensation, cost of transportation, administrative expenses, and a profit of not more than 2% of gross receipts for the LPA, will be distributed to pilots in accordance with Pooling of Wage Rules at the end of the year.	K-1, with a base daily rate paid on a monthly basis. At the end of the calendar year, monies collected, after expenses have been deducted, are divided among active pilots, with a pilot's percentage based on the pilot's total number of available days.
Pilot In-Training Compensation		If licensed but not fully certified, 75% of the daily rate the first year, 85% the second, and 95% the third. End-of-year distribution also distributed by these percentages.	If licensed but not fully certified, 70% of the daily rate the first year, 80% the second, and 90% the third. End-of-year distribution also distributed by these percentages.
Scheduled Rest Periods	6 consecutive days per month for March through November	7 consecutive days per month for May through November	May 1 through November 15 established at the preseason meeting (Currently 10 days a month May through October and 5 days in November.)

Figure 1: Great Lakes Pilotage Districts depicts the entire system, indicating the three Districts and the designated waters (orange) and undesignated waters (blue) within each. More detailed figures for each District are provided in **Figure 2: District 1 Bridge Time Areas and Change Points** through **Figure 4: District 3 Bridge Time Areas and Change Points,** with the pilot change locations identified as well as the locations on undesignated waters where the pilot is required to be on the bridge.

To provide insight into the scope of work performed by the three pilot associations, the following observations taken from the 2011 Klein system data provide a general overview of the U.S. pilotage services provided on the Great Lakes:

- There were approximately 2,800 pilotage assignments and 160 movages, with 40% handled by District 1 and 30% each by Districts 2 and 3. Pilots in District 3 recorded the most bridge hours, with an average 1,250 hours each. Districts 1 and 2 averaged approximately 940 hours each.
- The shared U.S./Canadian pilotage costs for a trip from Snell Lock through the Great Lakes to Superior, WI, stopping in Cleveland and Sault Ste. Marie, are approximately $52,000. Approximately $10,000 of that cost is for pilotage fees associated with the Welland Canal, reserved for Canadian pilots.
- It takes approximately four days to travel from Snell Lock to Duluth, MN (without delays):
  - A trip from Snell Lock to Cape Vincent averages 10.5 hours.
  - A trip across Lake Ontario averages 11 hours.
  - A Welland Canal transit is approximately 11 hours.

  - Traversing Lake Erie takes approximately 17 hours.
  - Traveling the Detroit River through to Buoy 12 in Port Huron takes 7 hours.
  - Traveling across Lake Huron takes 14 hours.
  - Transiting the St. Marys River takes approximately 7 hours.
  - Traveling across Lake Superior takes 22 hours.
- Approximately 84% of the traffic continues through Lake Ontario, 60% through Detroit, 23% into Lake Superior, and 19% into Lake Michigan.

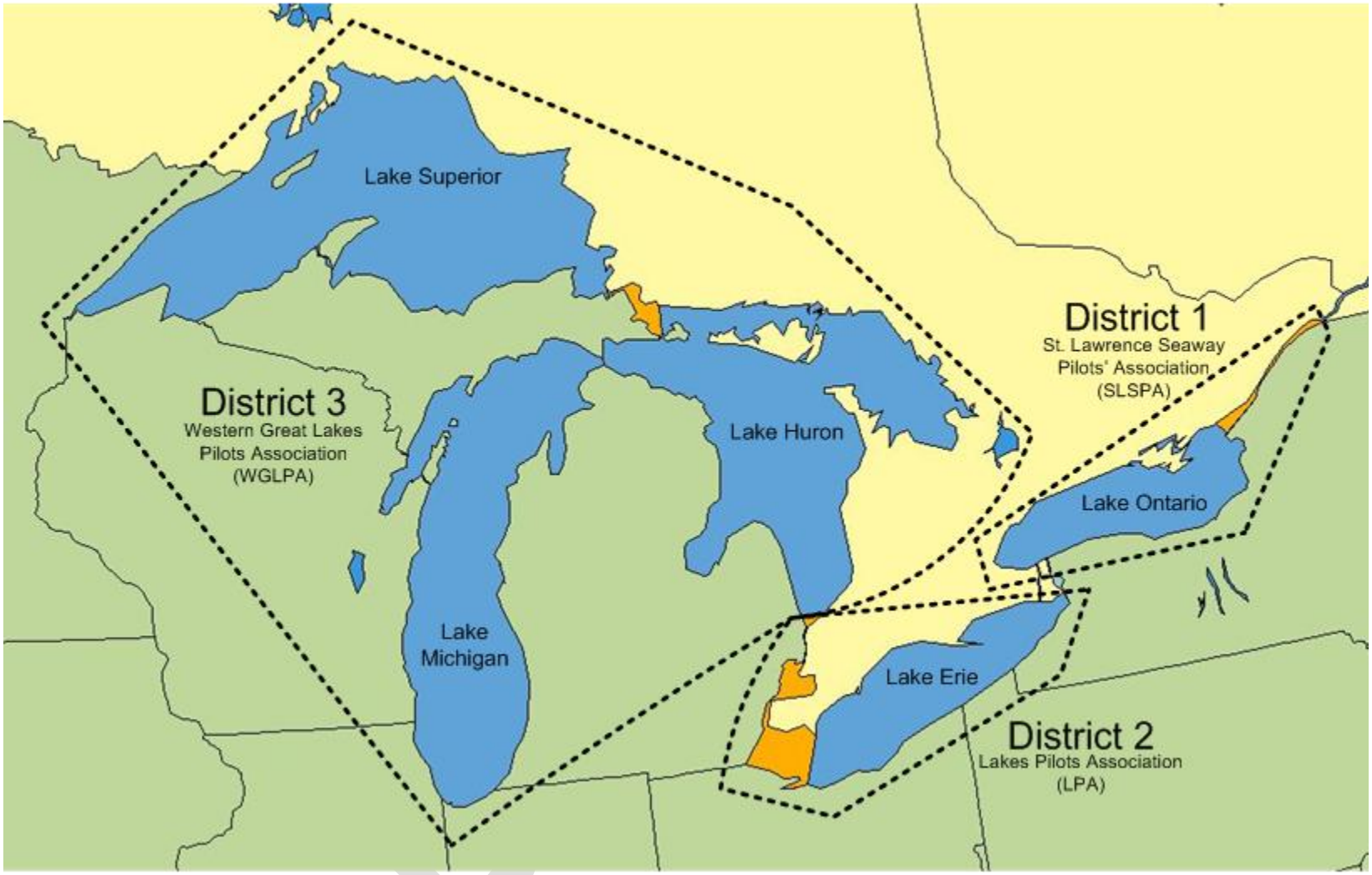


Figure 1: Great Lakes Pilotage Districts

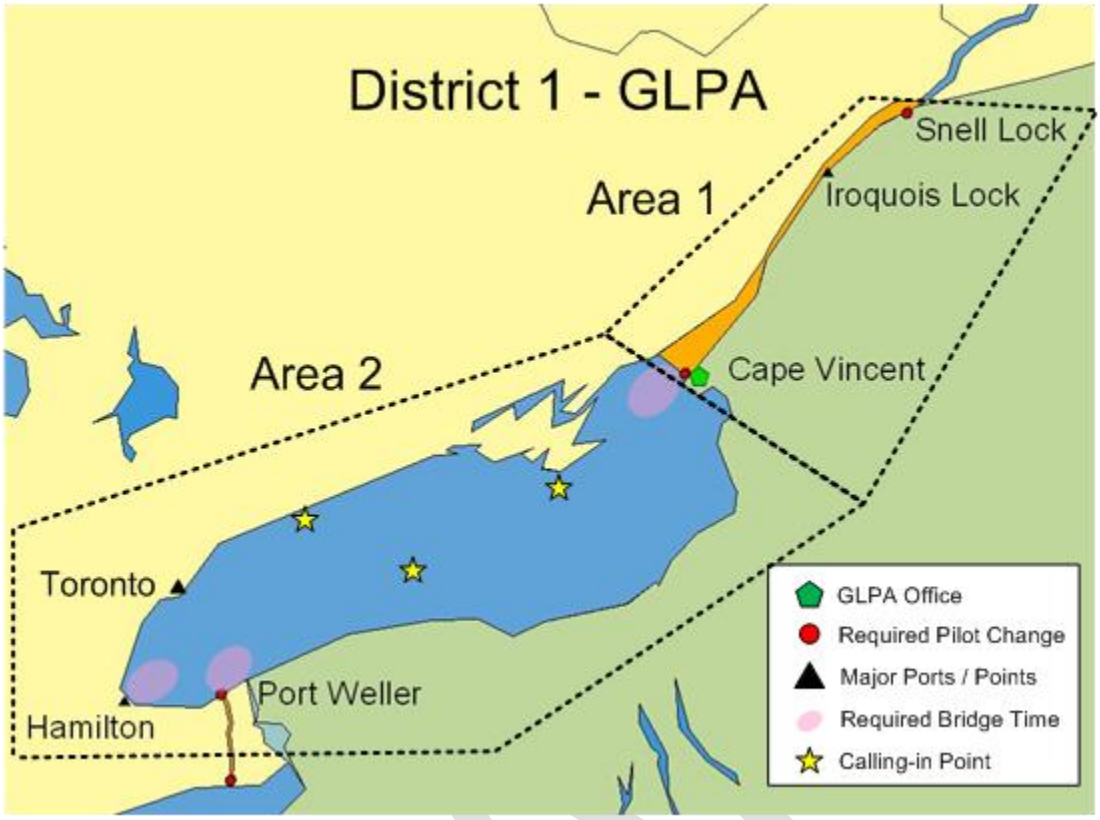


Figure 2: District 1 Bridge Time Areas and Change Points

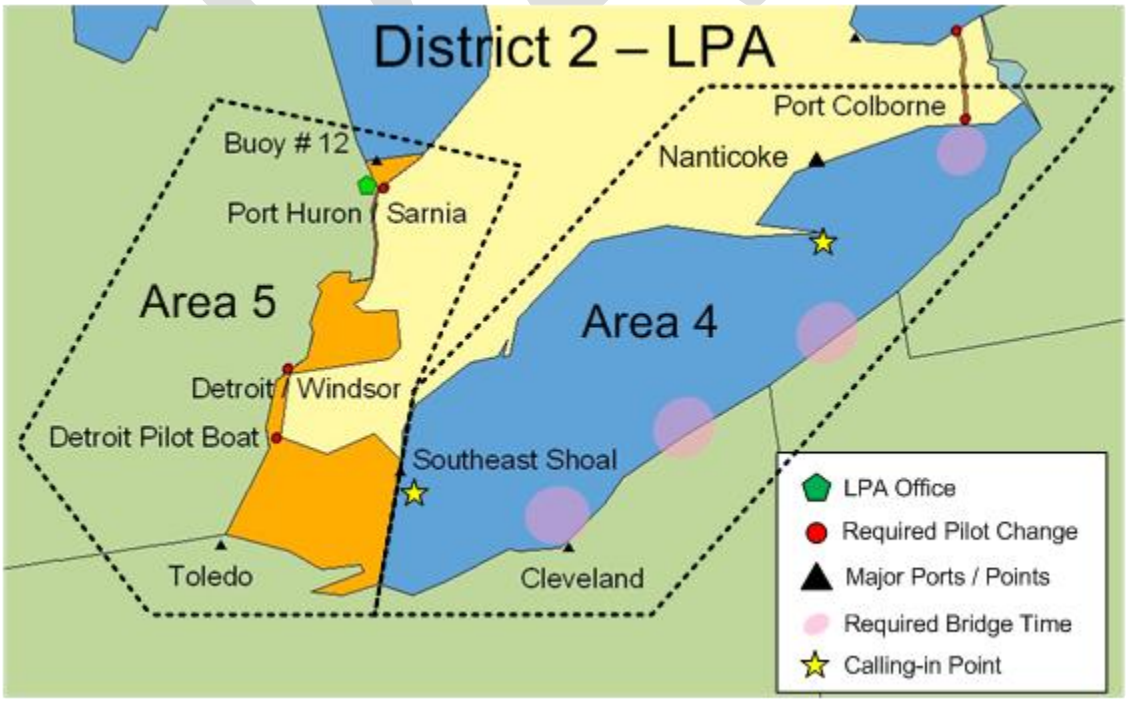


Figure 3: District 2 Bridge Time Areas and Change Points

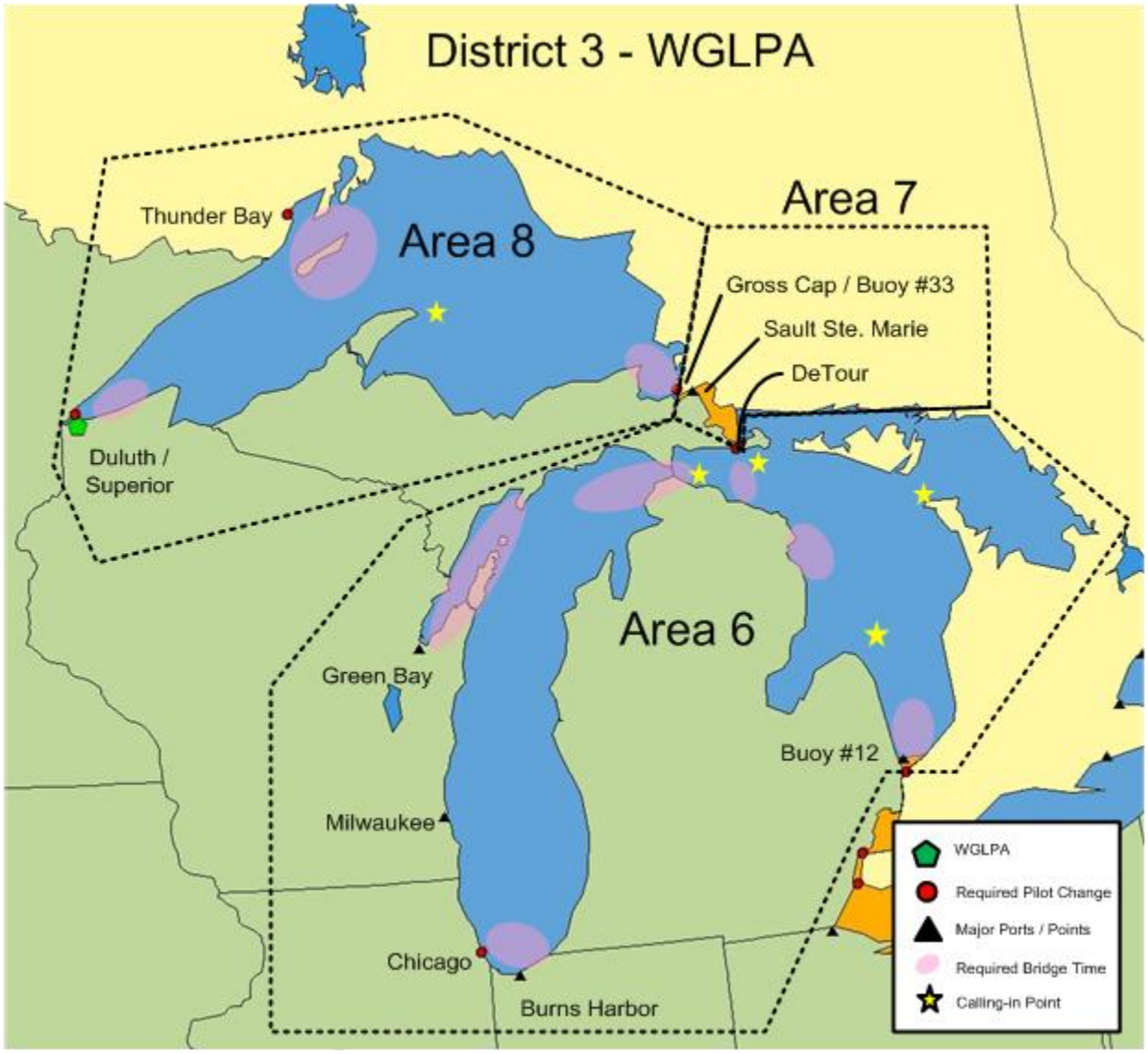


Figure 4: District 3 Bridge Time Areas and Change Points

1.2 Background

The Great Lakes Pilotage Act of 1960 (46 U.S.C. 93) requires the Secretary of Homeland Security to prescribe by regulation rates and charges for pilotage services, giving consideration to the public interest and the costs of providing the services. The process is transparent, with the Director of Great Lakes Pilotage posting the recommended adjustments in the Federal Register and opening up the process for comment by stakeholders. A follow-on final ratemaking rule is then published.

The Code of Federal Regulation (CFR), Title 46: Shipping, Chapter III: Coast Guard (Great Lakes) specifies the details of administering Great Lakes pilotage. The following is a list of the separate sections and a general description of the contents:

- 46 CFR 401 – Great Lakes pilotage regulations:
  - Registration of Pilots
  - Establishment of Pools by Voluntary Associations of U.S. Registered Pilots
  - Rates, Charges, and Conditions for Pilotage Services
  - Penalties; Operations without Registered Pilots
  - Procedure Governing Revocation or Suspension of Registration and Refusal to Renew Registration
  - Operating Requirements for U.S. Registered Pilots and Holders of Certificates of Authorization; Authority of the Director Over Operations
- 46 CFR 402 – Great Lakes pilotage rules and orders:
  - Registration of Pilots
  - Establishment of Pools by Voluntary Associations of U.S. Registered Pilots
- 46 CFR 403 – Great Lakes pilotage uniform accounting system:
  - General: Applicability of system of accounts and reports, Records, Accounting entities, Accounting period, and Notes to financial statements.
  - Inter-Association Settlement: Defines the settlement statements required for shared U.S./Canada regions
  - Reporting Requirements
  - Source Forms: Specifies the use of the uniform pilot's source form used to track each pilot assignment.
- 46 CFR 404 – Great Lakes pilotage ratemaking
  - General Ratemaking Provisions
  - Guidelines for the Recognition of Expenses
  - Ratemaking Procedures and Guidelines
  - Appendix A – Ratemaking Analysis and Methodology
  - Appendix B – Ratemaking Definitions and Formulas
  - Appendix C – Procedures for Annual Review of Base Pilotage Rates

The current ratemaking process has evolved over the past 20 years into a systematic and repeatable process. Over the past 10 years, two approaches to establishing the rates have been

exercised and are described in Appendix A and Appendix C of 46 CFR 404. Appendix C is an abbreviated form of Appendix A, carrying out a ratemaking process in seven steps. This task and analysis concerns the ratemaking methodology used by the Coast Guard to conduct the statutorily required ratemaking pursuant to 46 CFR 404, Appendix A.

A flow diagram for the Ratemaking Analyses and Methodology is provided in **Figure 5: Appendix A Ratemaking Methodology.** Ratemaking steps specifically called out for this study are circled in green. Those factors in red (asterisks) are presumed to be high-impact factors based on:

- Their influence on the calculation;
- The ability to vary the figure to influence the calculation; or
- The inability to accurately estimate the figure in a repeatable fashion.

In general the steps are as follows, with emphasis placed on the contribution of the areas identified for this study:

- **Step 1 – Projection of Operating Expenses.** This calculation is based on actual operating expenses submitted by each association and now audited on an annual basis[2] to determine if they are necessary and reasonable. Operating expenses are adjusted for inflation. None of the areas identified for this study impact the determination of operating expenses.
- **Step 2 – Projection of Target Pilot Compensation.**[3] A projection of the annual amount of target pilot compensation that pilotage rates should provide in each area. These projections are based on the latest information on the conditions that will prevail in the ratemaking year. The current methodology estimates a total compensation figure based on American Maritime Officers (AMO) union contracts and multiplies that figure by the number of pilots. Determining the number of pilots is based on the projected demand for services and the expected work standard of a pilot in each of the areas. This study looked at three contributing factors to estimate pilot compensation:
  - Alternative methods for estimating the total compensation for pilots;
  - Projected demand for pilotage services; and
  - Expected work standard for each pilot (currently based a standard of 1,800 bridge hours in undesignated waters and 1,000 bridge hours in designated waters).
- **Step 3 – Projection of Revenue.** A projection of the revenue that would be received if demand for pilotage services matches the bridge hour projection and pilotage rates were left unchanged from the previous year. An average hourly rate from the previous year's ratemaking is adjusted for the previous year's rate multiplier to determine average revenue generated per hour if rates are not changed. This is multiplied by the projected demand to project the revenue generated.

[2] Prior to 2010, audits were only conducted every five years.

[3] Throughout this report, "compensation" is the annualized sum of pilot "wages" and all "benefits."

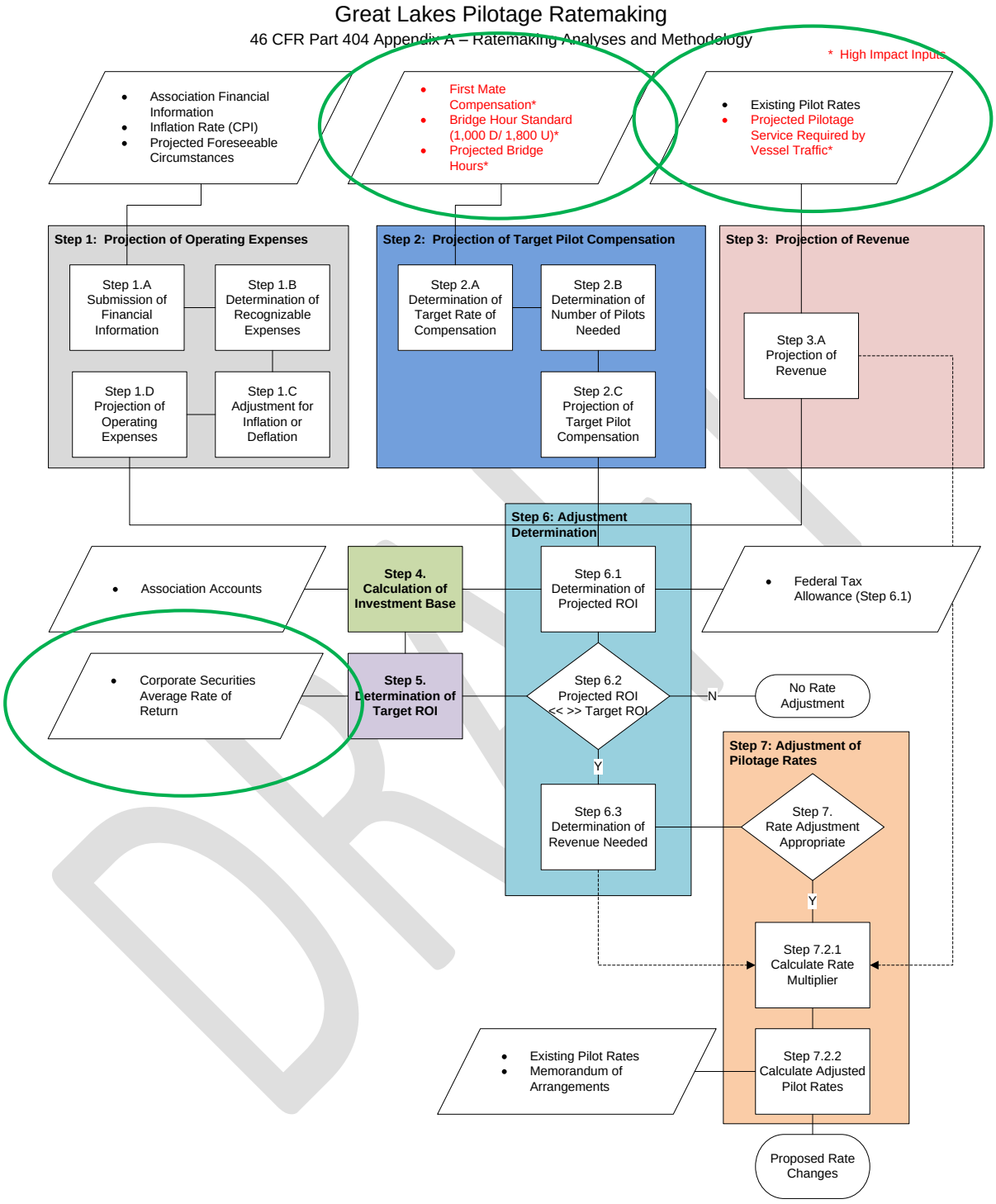


Figure 5: Appendix A Ratemaking Methodology

- **Step 4 – Calculation of Investment Base.** A calculation of each association's investment base, the recognized capital investment in the assets employed by the association required to support pilotage operations. The formula for this calculation is set out in 46 CFR 404, Appendix B. The investment base for each association is determined by a review of the financial records. Only those investments recognized by the Director are included in the investment base. Any asset or investment that is not necessary to provide pilotage services is excluded. This analysis did not review this factor.
- **Step 5 – Determination of Target Rate of Return on Investment.** A determination for a market-equivalent ROI that will be allowed for the recognized net capital invested in each association by its members. Currently the process uses Moody's Seasoned Aaa Corporate Bond Yield and a standard ROI calculation. This review looked at the applicability of this index and the calculation.
- **Step 6 – Adjustment Determination.** A determination is made as to whether sufficient revenue is projected (Step 3) to cover operating expenses (Step 1), target pilot compensation (Step 2), and the approved ROI on the investment base (Step 4). If sufficient revenue is not projected, the rate will be adjusted upward; if higher, rates will be adjusted downward.
- **Step 7 – Adjustment of Pilotage Rates.** Subject to negotiation with Canada or adjustment for other supportable circumstances, a rate adjustment is calculated by dividing revenue needed (Step 6) by the projected revenue (Step 3). A rate multiplier is applied to the previous year's rates to increase projected revenues and allow the projected ROI to equal the targeted ROI.

Distilled to its essence, the objective of the ratemaking process is to determine the required revenue as depicted in **Figure 6: Revenue Required to Promote Safe, Efficient, and Reliable Pilotage.**

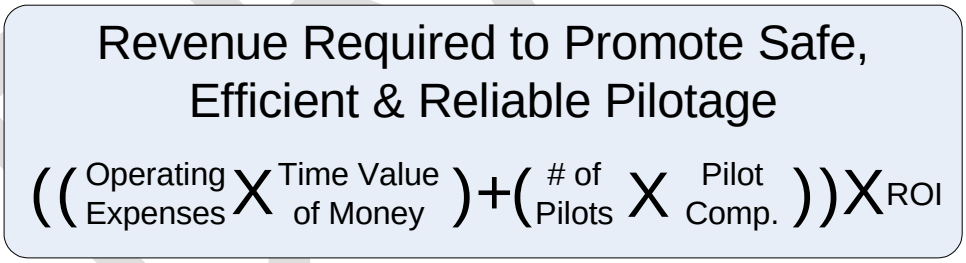


Figure 6: Revenue Required to Promote Safe, Efficient, and Reliable Pilotage

The objective of the Pilotage Rates is to develop and apply tariffs that will recover the required revenue to sustain pilotage operations.

1.3 Scope/Outcomes

The review and analysis conducted by MSI were carried out to identify recommendations to adjust the current ratemaking process. These serve only as recommendations, with any final determinations to be established by the Director of Great Lakes Pilotage after appropriate notification through the Federal Register and a period for comment.

Although specific recommendations in the areas identified are required, a global perspective of the process was undertaken. It was found during discussion with stakeholders that a fair and reasonable approach to determining pilotage fees needs to balance many factors, as depicted in **Figure 7: Pilotage Stakeholder Interests.** The Coast Guard's lead responsibility is to speak to the public interest.

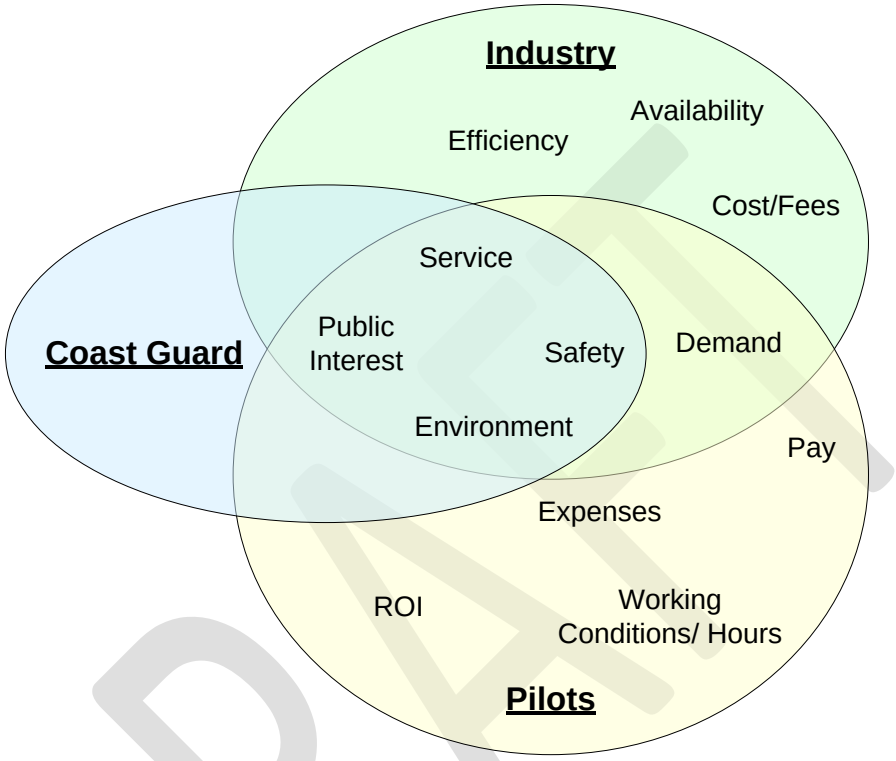


Figure 7: Pilotage Stakeholder Interests

1.4 Chartered Products

MSI was tasked to provide the following deliverables:

- A Draft Report of Findings and Recommendations presented to GLPAC during their meeting in February 2013.
- Facilitation of focus groups and stakeholder comment on the draft report.
- An Updated Draft Report (this report) incorporating initial feedback from the focus groups.
- A Final Report incorporating feedback to be presented at the next GLPAC meeting.

The following products are also being developed in this effort:

- A synopsis of key references reviewed during the analysis.
- Summaries of each stakeholder visit.
- A summary of focus group interactions held in conjunction with the GLPAC meeting.
- A summary of comments received from stakeholders and adjudication of those comments.

1.5 Analysis Methodology

The analysis was carried out in accordance with the steps laid out in the Statement of Work:

- **Study the Appendix A methodology and review prior rulemakings.** A full understanding of the ratemaking process and mathematics involved was undertaken. As discussed in the follow-on sections for each of the areas analyzed, the influence or sensitivity for each of the areas was reviewed.
- **Review previous bridge hour studies, analyses, and reports.** A large collection of reports and information were reviewed in preparing this report. A full listing is provided in the references section of this report and the synopsis of key references. Key among these are:
  - Pilotage Act of 1960
  - Code of Federal Regulations, Title 46
  - Comments Posted in Response to Notice of Proposed Rulemaking (NPRM) since 2007
  - Riker Report 2002 – *Review of Coast Guard Management and Oversight of Great Lakes Pilotage*
  - Comments received from stakeholders on the Riker Report
  - GLPAC Meeting Transcripts and Summaries
  - Dibner's 2012 *Review and Analysis of Harbor Pilot Net Incomes*
  - Transport Canada's *Fatigue Management Guide for Canadian Pilots: A Trainer's Handbook*
  - Martin Associates' 2004 *Review of Great Lakes Pilotage Ratemaking Methodology* and *Analysis of Great Lakes Pilotage Costs on Great Lakes Shipping and the Potential Impact of Pilotage Rate Increases*
  - Klein system data from 2008 through October 2012
- **Assess other approved industries with comparable challenges developing compensation rates, staffing levels, and seasonal work standards.** A review of available compensation rates of comparable services in both the private/state-controlled industry and within the federal government was conducted.
- **Evaluate other domestic and international pilotage groups.** Key information from the Dibner report and other sources was reviewed to identify comparable processes/parameters. The Canadian Great Lakes Pilotage Association (GLPA) comes closest to the type of work, environment, and vessels/cargo experienced by the U.S. Great Lakes Pilots. However, the GLPA is a government entity and has other advantages/disadvantages that set it apart. There is no other good comparison that can be used in its entirety. Where applicable, comparisons to other organizations are made within this report.
- **Conduct field visits at each of the U.S. Great Lakes pilot associations.** Visits to each of the pilot associations, U.S. and Canadian key industry representatives, and the Canadian GLPA were conducted. These discussions are summarized in **Table 2: Listing of Stakeholder Discussions.** A focus group with industry and the pilots will be held in response to the draft report.
- **Analyze available information.** Information from the Klein system for the years 2008–2012 and other data provided from stakeholders were analyzed to develop estimation

parameters for this report. Much of the data was deemed incomplete or inaccurate by the stakeholders. Gaps in information were filled out according to a governing set of assumptions in order to present example calculations. These calculations are presented here only as an example of implementation of the methodology. Supplemental recommendations for improving the accuracy and consistency of the data are presented in this report. The methodologies recommended in this report will only be improved with more accurate and consistent data. Another important application of the data analysis was to determine the frequency of anecdotal occurrences that would significantly impact the ratemaking process to determine if they occur on a regular basis and should be considered when developing a recommendation.

- **Develop report.** This Updated Draft Report will be reviewed by stakeholders and interested public entities, with comments provided directly back to MSI. MSI will not share these comments with the public and will evaluate and consider those comments in the Final Report to be presented at the next GLPAC meeting in the summer of 2013.

Table 2: Listing of Stakeholder Discussions

Date	Organization	Participants
9/18/2012	Canadian Shipping Agents and Owners	• Mr. Michael Broad, President, Shipping Federation (ShipFed) of Canada • David Grieve, Vice President of Operations, FEDNAV • CAPT Jean Francois Belzile, Director of Marine Operations, ShipFed • Andrew Digby, Vice President of Operations, Robert Reford Ltd. • Robert Vandenende, Gresco Ltd.
9/19/2012	Canadian Great Lakes Pilotage Authority (GLPA)	• Robert Lemire, President and Chief Executive Officer • CAPT Daniel Trottier, Director of Operations • Rejean Menard, Secretary/Treasurer
9/25/2012	U.S. Great Lakes Shipping Association	• Mr. Stuart Theis, Executive Director, USGLSA (and GLPAC member) • Dennis "Doc" Mahoney, Vice President of Operations, World Shipping, Inc. • Larry Del Regno Jr., Vessel Operations, World Shipping Inc.
10/18/2012	International Organization of Masters, Mates, and Pilots	• Mr. George Quick, Vice President, Pilots, International Organization of Masters, Mates, and Pilots
10/18/2012	Pilot Association Introductions at the American Pilots Association conference	• CAPT Roger Paulus, President, St. Lawrence Seaway Pilots' Association • CAPT Dan Gallagher, President, Lakes Pilots Association, Inc. • CAPT Don Willecke, President, Western Great Lakes Pilots Association, LLP

Date	Organization	Participants
10/19/2012	Retired Shipping Federation of Canada Subject Matter Expert	• CAPT Ivan Lantz (retired), Shipping Federation of Canada Director of Marine Operations
10/19/2012	Lake Carriers' Association	• Mr. Jim Weakley, President, Lake Carriers' Association (LCA)
10/24/2012	St. Lawrence Seaway Pilots' Association	• CAPT Roger Paulus, President • CAPT John Boyce • Ronald Jacobs, Accountant • CAPT Don Metzger • CAPT Richard Tetzlaff • CAPT Barrett Enck • Mike Zakarauskas, Massena Transport
10/29/2012	St. Lawrence Seaway Management Corporation	• CAPT Peter G. Burgess, Senior Marine Officer, St. Lawrence Seaway Management Corporation • Mr. Bruce Hodgson, Director, Market Development, St. Lawrence Seaway Management Corporation
10/31/2012	American Great Lakes Ports Association	• Mr. Steve Fisher, Executive Director, American Great Lakes Ports Association
10/31/2012	American Pilots Association	• Mr. Clay Diamond, Deputy Director, American Pilots Association
11/4/2012	Western Great Lakes Pilots Association	• CAPT Donald Willecke, President • CAPT Mark LaValley, Vice President • Jay Hartlieb, Accountant • Donna Webster, Dispatcher • CAPT Steve Vandercook, Pilot
11/6/2012	Lakes Pilots Association	• CAPT Dan Gallagher, President • CAPT Pat Gallagher, Pilot/ 2nd Vice President • CAPT George Haynes, Pilot/Treasurer • CAPT Phil Knetchel, Pilot • CAPT Wayne Coulston, Pilot • Bill Wager, Dispatcher
11/14/2012	St. Lawrence Seaway Development Corporation	• Craig Middlebrook, Acting Administrator, Washington Office • Carol Fenton, Deputy Associate Administrator, Operations Headquarters, Massena, NY • Lori Curran, Director, Office of Lock Operations and Marine Services, Massena, NY
11/19/2012	Canadian Laurentian Pilots Authority	• CAPT Denys Pouliot
12/19/12	Associated Branch Pilots	• CAPT Mike Lorino, President, Associated Branch Pilots
2/11/2013	Comments from GLPAC meeting	• 6 Coast Guard representatives • 6 Industry representatives (1 Canadian) • 25 Pilot representatives (3 Canadian and 1 visiting)

Date	Organization	Participants
2/11/2013	Pilot Focus Group discussion and comments	• 25 Participants (3 Canadian)
2/12/2013	Industry Focus Group discussion and comments	• 9 Participants (2 Canadian)
2/20/2013	Comments from the Canadian Shipping Companies	• Mr. Michael Broad, President, ShipFed • Mr. Jean Francois Belzile, Director of Marine Operations, ShipFed • Mr. Andrew Digby, Vice President of Operations, Robert Reford Ltd. • Mr. David Grieve, Vice-President, Vice President of Operations, FEDNAV • Mr. Robert Vandenende, Gresco Ltd. • Mr. Donal Poirier, President, Hapag Lloyd
3/1/2013	Comments from the Canadian Shipping Companies	• Mr. Michael Broad, President, ShipFed • Mr. Jean Francois Belzile, Director of Marine Operations, ShipFed • Mr. Andrew Digby, Vice President of Operations, Robert Reford Ltd. • Mr. David Grieve, Vice-President, Vice President of Operations, FEDNAV • Mr. Robert Vandenende, Gresco Ltd.

1.6 Assumptions

The ratemaking process is a dynamic system undergoing modifications while this report was being developed. As the ratemaking process continues to evolve, these assumptions must be revisited to validate their continued accuracy and applicability:

- Appendix A in 46 CFR 404 will be modified and followed each year; the Appendix C methodology in 46 CFR 404 will no longer be used. This provides a consistent approach from year to year for calculating rates and providing a comparison. The discussion in this report is in context of the Appendix A methodology.
- Annual audits will be conducted on the pilot associations. These audits are conducted on the previous season and are available for the ratemaking process following the year the audit is conducted. The audits provide validated information on expenses and compensation for the pilots.
- The length of the season is estimated at 280 days based on historical averages of seaway opening and closing for the past 10 years. The length of the season impacts the Seasonal Workload and the projected demand.
- Economic trends and discussions with industry representatives indicate moderate growth/decline in the amount of demand for pilotage services on the Great Lakes will occur over the next several years. A trend in moderate growth is considered to be less than 5% per year. Moderate changes were experienced over the past 15 years, with the exception of 2008 and 2009. A decreasing trend existed prior to 2008. Since 2009, demand has regained levels to that trend.

- The Klein system is intended to be the authoritative source for operational data.
- When processing the Klein system data:
  - Delay and Detention hours were subtracted from recorded bridge hours to provide actual time engaged on the vessel (the Time on Bridge). Those jobs resulting in a negative or null value were not considered when calculating time but were considered when calculating the number of jobs.
  - Movage was assumed for jobs beginning and ending in the same or nearby port. A "Trip" was considered any "completed" job in the Klein system that was not overland travel or considered movage.
  - Condensed ports were identified to simplify presentation of data. Condensed port names were based on recurring port names in the Klein system data (e.g., Hamilton Piers 8, 10, 11, 12, 14, 16, 21, 23, 23S, 25, 25N, 25S, 26 and anchorage were combined to Hamilton Condensed).
  - The endpoint of a job was considered a dockage unless the endpoint was an anchorage, buoy, or point of reference (e.g., Southeast Shoal).

1.7 Evaluation Criteria

The overall objective of the Great Lakes pilotage system is to provide safe and effective pilot services on the Great Lakes. This will result in safe and efficient movement of commerce on the Great Lakes at a competitive cost. Alternatives within this report are evaluated against a set of criteria in the general areas of safety, efficiency, and cost of providing pilot services on the Great Lakes. Additionally, recommendations on the ratemaking process itself are evaluated.

Alternatives are assessed against the criteria and assigned a positive or negative value based on the alternative's impact on the criteria. A statement of risk associated with each alternative is provided in each area, as well as an overall risk statement for the chosen recommendation. In **Appendix B: Assessment of Alternatives,** each assessment of alternatives is provided in its entirety. Within the body of the report, an assessment summary at the category level is provided as shown in **Table 3: Example Assessment Summary.**

Table 3: Example Assessment Summary

	Current	Alt 1	Alt 2	Alt 3	Risk Statement
Safety	-5	3	7	3	**Risk to Safety**
					Statement of risk.
Efficiency/Reliability	-5	3	7	3	**Risk to Efficiency/Reliability**
					Statement of risk.
Cost	-2	2	6	2	**Risk to Cost**
					Statement of risk.
Ratemaking Process	-5	2	2	2	**Risk to the Ratemaking Process**
					Statement of risk.
Overall Assessment	-12	7	15	7	

1.7.1 Evaluation Criteria

The following criteria will be evaluated in the areas of safety, efficiency, cost, and the ratemaking process. For each area, a risk narrative will be provided to address the components of risk in that area – threat, vulnerability, and consequence. An overall comment narrative provides clarification of the evaluation.

Safety

The risk statement will address to what extent the probability of an occurrence is increased or decreased and how the consequences can be mitigated through experience and appropriate reaction to an occurrence. Risks arise from fatigue, practices, and proficiency. The following criteria will be used to assess safety:

- **Fatigue Standards** – Fatigue associated with the current assignment, cumulative fatigue over multiple assignments, and cumulative fatigue over the entire season.
- **Managed Operating Risk** – There is no incentive created to take unnecessary risks to rush through a job or not adequately compensate for weather and traffic.
- **Reasonable Workload** – Pilots are able to adequately prepare for an upcoming assignment, including sufficient recuperative rest.
- **Qualified and Experienced Pilots** – Retain and recruit well-qualified and experienced pilots. Be able to develop experience for recruits and retain the experience of pilots on the Great Lakes.
- **Currency and Proficiency** – Sustain and improve the competency and proficiency of the pilots through regularly scheduled training programs.

Efficiency/Reliability

The risk of impacting the efficiency of the system (e.g., delays or adverse movements) will be summarized across the following criteria:

- **Minimize Delay** – The probability and frequency of delays occurring is mitigated. This includes delays by vessels and by pilots.
- **Sufficient Pilot Capacity** – Capacity balances the minimum number of pilots to manage costs and a maximum number in order to respond to surges in demand. A sufficient amount of excess capacity is desired in order to respond to surge demands. It also compensates for training and certification for new pilots and sustaining a qualified and proficient workforce.
- **Efficient Movement of Vessels** – Vessels move through the system at an efficient speed; slow movers are discouraged. Practices impacting the efficient use of pilot and vessel time are discouraged.

Cost

Risks associated with increasing costs and losing competitiveness with other modes of transportation will be summarized, as well as the impact on running both a shipping and pilotage business in the context of the following criteria:

- **Reasonable Rates** – Rates remain competitive. Rates respond to variability in demand and avoid excessive loss or unreasonable profits for the associations. Rates are proportional to providing efficient services. Additional costs are associated with an increase in performance/ efficiency of the system.
- **Stable Rates** – Rates don't fluctuate dramatically from year to year and are predictable.
- **Fair Pilot Compensation** – Factors to ensure compensation to the pilots is accurate, comparable to other similar occupations, and reflective of the cost of living in the area and level of expertise and professionalism expected. The number of pilots is not excessive.
- **Adequate Cost Recovery** – Estimates of costs and revenue are reasonable.

The Ratemaking Process

The risks associated with the ability for the process to inform and engage stakeholders, promote investment, reduce conflict, and produce acceptable results will be addressed in the following criteria:

- **Stability/Repeatability –** Large fluctuations in results are minimized. The process produces acceptable, repeatable, and predictable results. Given the same circumstances and interpreted by different individuals, a comparable result is achieved.
- **Transparency –** Information used in the ratemaking process or decisions made during the ratemaking process are readily traceable to information available to stakeholders.
- **Simplicity –** The ratemaking process reduces calculations and the need for complicated explanations. There is clarity and consistency of terminology and values across all stakeholders.
- **Accounts for Interdependencies –** Impact of values is confined to a single part of the ratemaking calculation as much as possible. Interdependencies are identified and influences managed.
- **Promotes Investments** – There is a motivator to invest in the system, maintain a high level of safety, increase the efficiency, and manage the cost of providing piloting services. This includes sustaining training programs to invest in the proficiency of the pilots.

1.7.2 Alternative Assessment

Each alternative is assessed against each of the criteria and assigned a numerical value based on the alternative's positive or negative impact on that criterion. **Table 4: Alternative Assessment Values** describes the thresholds used to assign a value. These values reflect both the positive or negative impact and the degree of certainty of that impact.

Table 4: Alternative Assessment Values

Numerical Evaluation Assignments for Each Criteria	
+5	Strong or compelling alternative with long-term implications for the ratemaking process.
+3	Significant justification exists to exercise the alternative.
+1	An acceptable alternative that may provide some benefit.
0	No impact on the current state.

Numerical Evaluation Assignments for Each Criteria	
-1	The alternative may negatively impact the results of the ratemaking process.
-3	The alternative will definitely negatively impact the results.
-5	The alternative will adversely impact the safe and efficient delivery of pilot services.

The total sum for each of the four assessment areas (Safety, Efficiency/Reliability, Cost, and Ratemaking Process) will be presented and color-coded based on the following:

- No coloring – Little impact (+/- 2 points or less)
- Yellow – Some impact in the negative direction (5 points or less)
- Red – Significant overall negative impact (greater than 5 points) or an evaluation of -5 points in any one criterion.
- Green – Positive impact (5 points or greater) or an evaluation of +5 points in any one criterion with no other criteria being evaluated at -5 points.

1.8 Document Overview

This document is organized into the following sections and appendices:

- **Section 1: Introduction –** Describes the tasking, team composition, stakeholders, and other products addressed by this study and an overview of this product.
- **Section 2: Specific Findings and Recommendations** – Presents a review of the areas identified in the Statement of Work.
- **Section 3: System Issues** – Presents a collection of issues associated with identified problem areas within the Great Lakes pilotage system including: Hidden Risk, Revenue Gap, Ratemaking Benchmarks, Sustaining Pilot Proficiency, and Ratemaking Management/Governance.
- **Section 4: Recommendations** – Presents the collection of specific parameter and system recommendations, grouped to address each of the identified problem areas. Inter-relationships among the recommendations, and example calculations on the impact on the ratemaking process, are presented.
- **Appendix A: Glossary and References –** Provides a glossary of terms and acronyms used in this document and their definitions, as well as a list of significant references consulted in preparing this document.
- **Appendix B: Alternative Assessments –** Presents the full detail of the assessments within each section. Summarized assessments are contained within the body of the document.
- **Appendix C: Supporting Information and Calculations** – Provides more-detailed information supporting the calculations in the body of the report.
- **Appendix D: Pilotage Services Comparison –** Presents a summary of pilot organization comparative information.

2. SPECIFIC FINDINGS AND RECOMMENDATIONS

Each of the areas identified to be studied is discussed here along with its influence on the ratemaking process and recommendations. An overview and description of the topic is presented in conjunction with how it is used in the existing Appendix A ratemaking methodology. Alternatives are presented along with example calculations to provide insight into the possible impact on the ratemaking process. The specific parameters identified in the tasking to MSI are:

- Update the existing bridge hour definition.
- Establish a seasonal work standard for pilots.
- Evaluate staffing levels.
- Evaluate the efficacy of the current billing scheme.
- Assess the standard for calculating target return on investment (ROI).
- Review the appropriate benchmark for estimating pilot compensation (including target compensation versus actual compensation).

2.1 Clarifying Terminology

As reported in the Riker study of 2003 and continuing today, "a lack of common reference significantly hampers stakeholders from understanding each other." The scope of this section is to clarify the terminology and reduce any overlap in terms (specifically, the previously used term "Bridge Hour"). How each of these terms is used in the ratemaking process will be addressed in subsequent sections. This is not a one-for-one replacement of terminology in the existing ratemaking process. Rather it is a new set of terms that remove overlap that can lead to miscommunications. The scope of each term was carefully reviewed to ensure that its influence on the ratemaking process is isolated to one area.

"Bridge hours are the number of hours a pilot is aboard a vessel providing pilotage services."[4] For designated waters, the pilot is required to be on the bridge at all times. In undesignated waters, the pilot only needs to be readily available to the bridge. In undesignated waters, the entire time the pilot is on the vessel is considered a bridge hour, even though he or she may not be on the bridge of the ship.

Multiple and contradicting applications of the term "Bridge Hour" within the ratemaking process have caused considerable confusion. The two applications of the bridge hour definition – in Step 2.b in estimating the number of pilots (related to pilot capacity) and in Step 3.a when calculating expected revenues (relating to providing chargeable service to the customer) – oppose each other. The inclusion of delays, detentions, and cancellations (DDC) for one application is contrary to inclusion in other applications of the "Bridge Hour" within the ratemaking process. This section looks at clarifying the terms and definitions used throughout the report.

First, the term "Bridge Hour" within the existing ratemaking process could refer to the bridge hour standard of 1,000/1,800 hours in designated/undesignated waters. The bridge hour standard is only used in Step 2.b of the ratemaking methodology to estimate the number of pilots needed. If DDC are included in the definition but the same standard value (1,000/1,800) is used, the same

[4] 46 CFR 404, Appendix A, Step 2.b(1). First used in 12 April 1994 NPRM.

result will occur when estimating the number of pilots (i.e., the projected demand would still be divided by the same 1,000/1,800 figure). If the seasonal standard is also adjusted for DDC, then the net effect of changing both the projected bridge hours and the bridge hour standard does not change the result of the ratemaking process (i.e., both the projected demand and seasonal work standard would be increased in the same proportions to result in the same number of pilots needed). The analysis to change the value of the standard is presented in **Section 2.2: Seasonal Work Standard.**

Secondly, the term "Bridge Hour" could refer to the projected bridge hours. A full analysis would need to be conducted to determine how many hours to add to compensate for DDC within the projected bridge hours. In the future, not only would future demand for piloting services need to be projected but a projection for the estimated delays and detentions would need to be provided as well. This only further complicates the projection process.

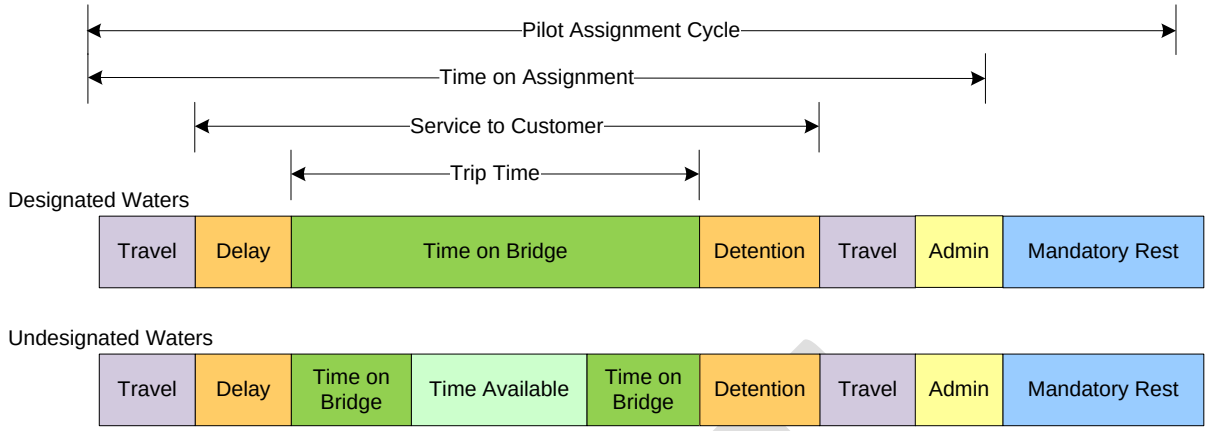
The projected bridge hours are also used to calculate projected revenue in Step 3 by multiplying the projected bridge hours by an average hourly rate:

- If the projected hours are increased to include DDC, then the rate would decrease because there are more hours anticipated to generate revenue. This only increases the current revenue gap.
- Because DDC are not included in the projected bridge hours, the revenue generated by DDC is *in addition to* the revenue estimated in the process and, in essence, provides unaccounted-for revenue to the pilot associations (i.e., by not including DDC in the estimation of revenue generated, the revenue gap is reduced).

Recommendations will be presented to transition from bridge hours to the number of assignments as a unit of measure in Steps 2.b and 3. The concept of "Bridge Hours" is difficult to envision when projecting how many there will be, what service is being provided to the customer, and how many a pilot can complete. Expressing the concept in "assignments" provides a direct relationship to the collection of activities performed by the pilots and the services provided to industry.

The collection of terms depicted in **Figure 8: Example Pilot Activity Terminology** will facilitate clear communication of parameters when establishing rates**.** The illustration provides a breakdown of a pilot's time and supports discussions throughout the report regarding consumption of pilot capacity. The terms shown in the figure are defined later within this section. "Trip Time" is being introduced to remove confusion with the term "Bridge Hours." DDC are not considered part of the definition of the "Trip Time." DDC are included when discussing "Time on Assignment" and the "Pilot Assignment Cycle."

Throughout this report, there is a subtle distinction between using the terms "trip" and "assignment." The context of the discussion must be taken into consideration when these terms are used. If the context of the discussion is scoped to only the time spent on the vessel actively providing pilot services to the vessel (the current scope of the term "Bridge Hour"), then "trip" will be used in that discussion. If the discussion is more expansive and includes the other activities associated with providing pilot services, then "assignments" will be used in the discussion.



Notes:

- "Cancellation" consumes pilot capacity through "Travel," "Delay," and "Admin" time. "Mandatory Rest" after a cancellation is dependent on the Association Work Rules.
- "Travel" is to/from the pilot station, "Homeport," or "Base" (points designated by the pilot associations where pilots are dispatched from) to the point of embarkation/debarkation.

Figure 8: Example Pilot Activity Terminology

Alternative 1: Include delays, detentions, and cancellations (DDC) in the definition of "Bridge Hour."

Simply including DDC in the term's definition addresses the value assigned to "Bridge Hour" but does not clarify its use for the two different purposes within the ratemaking process. The purpose of this section is to recommend clarification of the terminology. The impact of including DDC in "Bridge Hour" within the ratemaking process will be addressed in **Section 2.3.2: Estimating the Number of Pilots.**

Alternative 2: Provide clarification and separation of terms used.

Activities associated with providing pilotage services are depicted in **Figure 8: Example Pilot Activity Terminology.** These activities start when the pilot commences travel from the pilot station, "Homeport," or "Base" (points designated by the pilot associations where pilots are dispatched from).

The following terms will be used throughout this report for clarity. Discussion regarding the *application* of these terms will be carried out within each section of this report:

- **Time on Bridge** – Time the pilot is on the bridge of the vessel providing guidance to the master and crew or fulfilling navigational requirements.
- **Time Available** – Used in undesignated waters only, this is the time the pilot is onboard the vessel, not necessarily on the bridge but readily available to the master or crew to satisfy navigational requirements.
- **Trip Time** – The time spent aboard the vessel in the course of providing pilotage services. This term is used in lieu of "Bridge Hour" to provide a more succinct definition and remove the ambiguity of using the same term for multiple (and conflicting) purposes. In the case of designated waters, it is expected that the entire time providing pilotage services is spent on

the bridge. For undesignated waters, this is a combination of Time on Bridge and Time Available.

- **Travel** – The time for the pilot to travel from/to the pilot station, "Homeport," or "Base" to/from the point of embarkation/debarkation on the vessel. In accordance with association work rules, a rest period may also be associated with performing lengthy travel. This includes pilot boat transit time to/from the vessel.
- **Mandatory Rest** – The rest period at the conclusion of an assignment in accordance with association work rules.
- **Time on Assignment** – Necessary and reasonable time spent to provide pilot services. This includes the previous definition of "Bridge Hour" and other activities to provide pilot services. Because of the multiple uses of "Bridge Hour" in the current methodology, these other activities cannot simply be added to the definition of "Bridge Hour." Separate terms need to be defined for the separate uses within the ratemaking methodology to avoid ambiguity and conflict. Items included in Time on Assignment are:
  - Travel to/from a designated pilot homeport or base to the point of embarkation/ debarkation
  - Trip Time
  - Delay or detention
- **Pilot Assignment Cycle** – The collection of mandated activities to complete an assignment making the pilot unavailable for another assignment. This is the total pilot capacity consumed for an assignment.
- **Cancellation** – The pilot performs activities associated with an assignment, including the possibility of being delayed before the cancellation notice is provided. The detention time would be zero for a cancellation, but the pilot still needs to travel back and perform administrative work for the cancellation. Mandatory Rest associated with a cancellation is dependent on the pilot association work rules. Cancellations still consume pilot capacity.
- **Service to Customer** – During these activities, the pilot is either onboard the vessel, waiting to board the vessel after a delay, or detained on the vessel after providing services. This time is chargeable to the customer and recorded in the Klein system. During this period, the customer has direct visibility into a service being provided by the pilot.

Assessment of the terminology discussed above is provided in **Table 5: Assessment of Clarifying Terminology.** The recommendation is to clarify the terminology (Alternative 2). This assessment is only scoped to providing an alternative, clearer set of terms and definitions used in the ratemaking process. The impact these terms have on the ratemaking methodology will be addressed in other sections of this report.

Table 5: Assessment of Clarifying Terminology

		Alt 1	Alt 2	Risk Statement
Safety				**Risk to Safety**
				N/A
Efficiency/Reliability				**Risk to Efficiency/Reliability**
				N/A
Cost				**Risk to Cost**
				N/A
Ratemaking Process		-7	7	**Risk to the Ratemaking Process**
				Ambiguity of terms risks inconsistent use. Clearer definitions separate the application of each term in the process.
Overall Assessment		-7	7	
	Comment: This assessment is scoped to just the terminology. The impact on the ambiguity of the terms in other areas will be addressed in the appropriate section of the report.			

Recommendation:

Use clear and more-distinct terminology in the ratemaking process to remove ambiguity and mitigate the interdependency of ratemaking factors. The application of this terminology in determining a reasonable work standard will be discussed in **Section 2.2: Seasonal Work Standard** and in estimating the number of pilots in **Section 2.3: Staffing Levels.** These sections will be evaluated on many more of the criteria for safety, efficiency, and cost.

For clarity within the report, the terms as defined in **Figure 8: Example Pilot Activity Terminology** will be used.

2.2 Seasonal Work Standard

A seasonal work standard is the amount of time a pilot is expected to engage in pilotage activities during the season. The season is typically 280 days out of the year. Currently the seasonal work standard is expressed in terms of bridge hours (Trip Time) and is set at 1,800 hours for undesignated waters and 1,000 hours for designated waters.[5] The difference in the standards reflects the availability of the pilot to the bridge and how much "work" a pilot in

[5] The history of bridge hour standards for designated and undesignated waters shows that an initial standard of 1,000/2,000 was established in a 1972 review. A U.S. Department of Transportation (DOT) study in 1988 recommended modifying the standard to 1,000/1,800. The Riker study in 2003 recommended a standard of 1,500/1,500 based on a 273-day season, weekends and holidays off, and averaging eight hours of work a day. A letter submitted by the Longshoremen in November 2002 in response to the Riker study also provided some insights into possible reasoning for the bridge hour standard as it relates to the bridge hour definition: 250-day season at eight hours per day (2,000 hours); 20 hours required on the bridge for the master for each average five-day trip from Duluth to Cleveland. A 250-day season allows for 50 trips, resulting in 1,000 hours. Over the past several years, pilots have had difficulty attaining this standard. As will be shown in this analysis, these standards are difficult to attain.

undesignated waters is actually performing during a pilot assignment. Fatigue will become more of a factor with time spent engaged in pilot duties on the bridge. Pilots in designated waters are required to be on the bridge "direct[ing] the navigation of the vessel subject to the customary authority of the master." It is possible for a pilot to spend a lengthy period of time aboard the vessel in undesignated waters (in excess of 12 hours) but minimal time performing pilot duties on the bridge, with the other time "[a]vailable to direct the navigation of the vessel at the discretion of and subject to the customary authority of the master." (46 U.S.C. 9302(a)(1)) Intermittent rest periods during the voyage allow for prolonged continuous time on the vessel and longer "Trip Times."

A bridge hour standard is currently used in Step 2.b to estimate the number of pilots needed in each area to meet demand. The projected bridge hour demand is divided by the current bridge hour standard (1,000/1,800 hours) to estimate the number of pilots needed. Estimating staffing levels will be discussed in **Section 2.3.2: Estimating the Number of Pilots.**

The seasonal work standard should be established based on analysis of activities to provide pilotage services rather than on a (seemingly) arbitrary number of 1,000/1,800 hours for undesignated/designated waters. The standard should account for adequate rest, scheduled time off, scheduling efficiency, professional training and ability to respond to peak demand. Because the operations in each area vary, the seasonal work standard should vary for each area. The standard should also vary as the distribution of traffic and rate at which pilot capacity is being consumed changes. The Klein system should be used as the authoritative source for operational data.

A pilot's annual capacity is broken down as shown in **Figure 9: Pilot Annual Capacity.** Definitions for terms used in the figure are provided in **Section 2.1: Clarifying Terminology.**

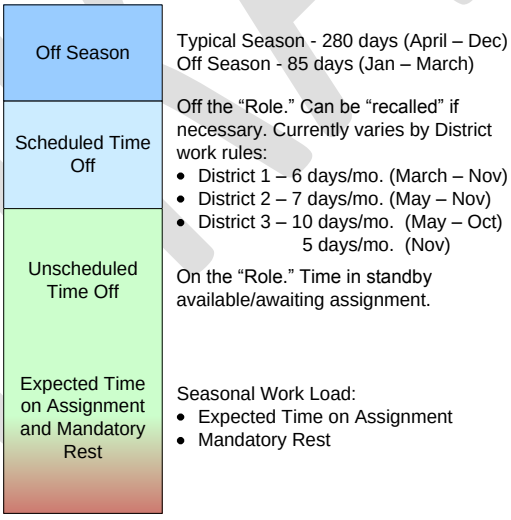


Figure 9: Pilot Annual Capacity

Using information from the Klein system, an expected level of effort for each assignment was calculated for each area as shown in **Table 7: Example Average Pilot Assignment Cycle for Each Area.** A complete set of statistics obtained from the Klein system data for years 2008–2011 are provided in **Appendix C** to this report. Each assignment cycle reflects activities performed and the typical time pilot capacity is being consumed. Movages are not included in

this analysis because of their variability; they are considered in the total workload through the efficiency factor:

- The Trip Time is calculated from the average trip time for trips recorded in the Klein system (does not include the average time for identified movages).
- Average Travel Time derived from the total overland travel for the area divided by the number of assignments (less movages). This travel is from the pilot office, designated homeport, or base to/from the point of debarkation.[6]
- Pilot Boat Transit estimated average transiting to/from the vessel on the pilot boat. Not all transits require a pilot boat at both ends. The estimated total pilot boat time for an area was determined by multiplying the pilot boat occurrences by the estimated pilot boat travel time listed in **Table 6: Pilot Boat Travel Times.** Although pilots may remain on board, it was assumed a pilot boat trip was taken for each assignment associated with one of these points. The total pilot boat time was then divided by the total number of assignments (less movages) to determine an average pilot boat travel time.

Table 6: Pilot Boat Travel Times

Assignment Origination/ Completion Point	Estimated Pilot Boat Travel (hrs)
Cape Vincent	0.25
Port Weller	0.50
Port Colborne	0.50
Detroit Pilot Boat	0.75
Port Huron	0.75
DeTour	0.50
Gros Cap	2.00

- Average Delay/Detention experienced based on the total Delay/Detention divided by the number of assignments (less movages). The majority of assignments did not record delay/detention, so the average is very low when spread across all assignments.
- Administrative time to complete necessary paperwork (assumed 30 minutes per assignment).
- After each assignment, the mandatory rest period is assumed to be consistent across the associations, despite differences in the work rules for each association.[7] It is recommended that the mandatory rest period be made consistent across Districts as part of the process of updating the work rules.

[6] Travel figures based only on pilot's travel to/from the "office/homeport/base" to the embarkation/debarkation point for the pilot. Commuting distance to/from the pilot home to the office is not included. District 3 association work rules allow for 30 minutes of rest for every hour driven when the pilot drives himself. It was reported by District 3 that pilots drive themselves 90% of the time. Overland travel times were reported directly from District 3 and were increased by 50% to account for this rest.

[7] District 1 work rules reflect 13 hours of mandatory rest. Districts 2 and 3 reflect 10 hours.

Table 7: Example Average Pilot Assignment Cycle for Each Area

		Trip Time (hrs)	Travel (hrs)	Pilot Boat Transit (hrs)	Delay (hrs)	Admin (hrs)	Total Time on Assignment (hrs)	Mandatory Rest (hrs)[8]	Pilot Assignment Cycle (hrs)
D1	**Area 1**	7.7[9]	2.7	0.3	0.5	0.5	11.7	13	**24.7**
	Area 2	10.3	3.9	0.6	0.5	0.5	15.8	13	**28.8**
	Area 3	***Welland Canal Exclusive to Canadian Pilots***							
D2	**Area 4**	11.0	4.1	0.4	0.5	0.5	16.5	13	**29.5**
	Area 5	6.0	2.5	0.9	0.4	0.5	10.3	13	**23.3**
D3	**Area 6**	22.4	2.9	0.8	0.7	0.5	27.3	13	**40.3**
	Area 7	6.1	1.5	2.2	0.2	0.5	10.5	13	**23.5**
	Area 8	21.6	3.6	1.9	2.8	0.5	30.4	13	**43.4**

Given the duration of a Pilot Assignment Cycle, the maximum number of assignments a pilot can complete within the days available during the season can be determined and is shown in **Table 8: Example Maximum Assignments in Season per Pilot.** The number of days available to the pilot was determined for a 280-day season and seven months of scheduled days off.[10] The total hours available during the season was then divided by the Pilot Assignment Cycle to obtain the Maximum Assignments in a season. Because of the significant variances in the Pilot Assignment Cycle by area, the Maximum Assignments in a Season are separately calculated and analyzed by area. For comparison to an hourly figure, the maximum Trip Time, Time on Assignment, and Time in Pilot Assignment Cycle are calculated by multiplying the number of maximum assignments by their respective averages for each area from **Table 7: Example Average Pilot Assignment Cycle for Each Area.** The "Trip Time" corresponds to the current definition of "Bridge Hour." The only way Area 2 and Area 4 can achieve their current Bridge Hour Standard of 1,800 hours is if they are scheduled for and work the Maximum Assignments in a Season. It is unreasonable to expect this maximum can be obtained. The Unassigned Time during the season reflects minimal capacity for surge demand if pilots could be scheduled at the maximum rate.

[8] Mandatory rest periods vary by District as shown in **Table 1: U.S. Great Lakes Pilotage System Overview.** A consistent mandatory rest period is used in these example calculations.

[9] Work rules within District 1 allow for the change-out of the pilot at Iroquois Lock, resulting in numerous "half" trips instead of the anticipated 10.5 average transit between Cape Vincent and Snell Lock.

[10] Scheduled time off varies by District as shown in **Table 1: U.S. Great Lakes Pilotage System Overview.** A consistent number of scheduled days off of 10 days per month for seven months of the season are used in these example calculations.

Table 8: Example Maximum Assignments in Season per Pilot

		Maximum Assignments in a Season	Maximum Trip Time (hrs)	Maximum Time on Assignment (hrs)	Maximum Time in Pilot Assignment Cycle (hrs)	Unassigned Time (hrs)
D1	**Area 1**	**204**	1,571	2,377	5,029	11
	Area 2	**175**	1,803	2,761	5,036	4
	Area 3	***Welland Canal Exclusive to Canadian Pilots***				
D2	**Area 4**	**170**	1,870	2,809	5,019	21
	Area 5	**216**	1,296	2,231	5,039	1
D3	**Area 6**	**125**	2,800	3,409	5,034	6
	Area 7	**214**	1,305	2,249	5,031	9
	Area 8	**116**	2,506	3,529	5,037	3

Long-term fatigue is addressed through the seasonal breaks and the scheduled time off each month during the season. However, short-term fatigue also must be addressed. Although mandatory rest at the end of an assignment may be sufficient for a single assignment, consecutive assignment cycles will lead to short-term cumulative fatigue. The number of these successive cycles should be limited, with a mandatory block of time for rest to break the short-term cumulative fatigue effects.

Within the *Collective Agreement This 19th Day of May 2009 between Great Lakes Pilotage Authority and Corporation of Professional Great Lakes Pilots and Canadian Merchant Service Guild*, in the section discussing "Rest between Assignments," back-to-back nighttime assignments are addressed as follows:

> "Sleep Cycle (T-4)
> (a) When a District No. 2 pilot has worked two consecutive nights, the pilot may ask not to be called before 0600 hours the following morning.
> (b) The pilot's position will be kept on the Tour de Role and if the pilot's services are required before the end of the pilot's rest, the next rested pilot would then be dispatched.
> (c) For the understanding of this rule, working nights means to be called for an assignment or transfer, or to end an assignment or transfer, between 0001 hours and or 0600 hours, or to be called for an assignment before 0001 hrs. and ending it after 0600 hours.
> (d) Since it is recognized that the above wording may not cover all circumstances, the Authority's representative may, upon request of the pilot concerned, apply the Sleep Cycle Clause when special circumstances warrant.
> (e) For the purposes of this rule, when a pilot is eligible to break the night cycle rotation, the pilot must notify the pilot office of the pilot's decision at the time of calling in after disembarking."

An efficiency factor is applied to the maximum assignments to address the cumulative short-term fatigue issue as well as the inability to achieve 100% efficiency in scheduling ships. The efficiency factor reflects expected pilot availability and compensates for:

- Surge demand and sufficient pilot capacity, balanced with the cost of excess pilots.

- High-readiness standby on the Tour de Role.
- Movages (which are not included in the expected assignment count).
- Pilot sustainment training scheduled during the piloting season.
- Unplanned absences.
- Recuperative rest for multiple sequential night assignments (to combat short-term fatigue in a similar manner to the Canadian GLPA collective bargaining agreements).
- Association administrative duties (e.g., piloting information updates, drills, meetings, professional development).

Alternatives for efficiency factor values are summarized in **Table 9: Seasonal Work Standard Alternatives.** In order to compare to the Bridge Hour Standard in the 2013 ratemaking ruling, the current bridge hour standard was divided by the Trip Time from **Table 7: Example Average Pilot Assignment Cycle for Each Area** to convert it to number of trips (the current definition of Bridge Hour is only scoped to Trip Time). There are large fluctuations to the anticipated number of trips when basing the seasonal work standard on the Pilot Assignment Cycle rather than a 1,000/1,800 hour standard. Each area has different typical operating characteristics reflected in varying standards rather than the two standards for designated and undesignated waters.

Table 9: Seasonal Work Standard Alternatives

		2013 FR Ratemaking Bridge Hour Standard (Hrs)	Example 2013 Ratemaking Standard (Trips)	Alternative 1: 60% Efficiency (Assignments)	Alternative 2: 50% Efficiency (Assignments)	Alternative 3: 40% Efficiency (Assignments)	2011 Klein Actual Average (Assignments/ pilot)
D1	**Area 1**	1,000	129	122	102	81	105
	Area 2	1,800	174	105	87	70	94
	Area 3	***Welland Canal Exclusive to Canadian Pilots***					
D2	**Area 4**	165	163	102	85	68	78
	Area 5	172	166	129	108	86	92
D3	**Area 6**	82	80	75	62	50	61
	Area 7	147	163	128	107	85	55
	Area 8	86	83	69	58	46	61

An assessment of the alternatives is provided in **Table 10: Assessment of Seasonal Work Standard.** The recommendation is to use a 50% efficiency factor (Alternative 2) as a starting point for pilot capacity. This will be further refined and validated in **Section 2.3.2: Estimating the Number of Pilots.**

Table 10: Assessment of Seasonal Work Standard

	Alt 1	Alt 2	Alt 3	Risk Statement
Safety	3	5	5	**Risk to Safety**
				Current work standards difficult to obtain. Pilots feeling fatigued and taking risks to achieve standards. Standard not benchmarked.
Efficiency/Reliability				**Risk to Efficiency/Reliability**
				N/A
Cost	1	3	1	**Risk to Cost**
				Setting the standard too low will increase costs. Projected revenues difficult to achieve if standard is too high.
Ratemaking Process	2	2	2	**Risk to the Ratemaking Process**
				Clear and full justification for work standards accounting for reasonable activities to provide pilot services.
Overall Assessment	6	10	8	

Recommendation:

- A seasonal work standard should be established based on pilot assignment cycles for each area determined from operational data within the Klein system and the application of a tailored efficiency factor. Tailoring the efficiency factor will be discussed in **Section 2.3.2: Estimating the Number of Pilots.**
- Because of the variations in the type and time on assignment in each area, it is recommended that a standard be established for each area.
- Revisit the seasonal work standard on a three- to five-year basis because of changes to traffic distribution and fluctuations in transit times.
- The mandatory rest period and the scheduled days off per month should be made consistent across the Districts.

Using a 50% efficiency factor as an example, a calculation is carried out in **Table 11: Example 50% Expected Pilot Utilization** to estimate the amount of time a pilot is working during the season**.** The Expected Trip Time, Time on Assignment, and Time in Pilot Assignment Cycle are found by taking the number of expected assignments and multiplying by their respective averages for each area. The Expected Time on Assignment is the total time the pilot is "working" during the 280-day season and is comparable to a typical 1,760-hour full work year. Alternatively, the Expected Time on Assignment could be divided by 52 weeks in a year or 40 weeks in a season to estimate an average weekly workload. The Expected Time in Pilot Assignment Cycle reflects the time the pilot is not available for assignment and includes mandatory rest periods, so the time is not entirely spent "working." Other efforts are conducted

as well during the season and are captured in the considerations of the efficiency factor listed previously.

Table 11: Example 50% Expected Pilot Utilization

		Expected Assignments	Expected Trip Time (hrs)	Expected Time on Assignment (hrs)	Expected Time in Pilot Assignment Cycle (hrs)	Unscheduled Time during the Season (hrs)
D1	Area 1	81	785	1,188	2,514	2,526
	Area 2	70	896	1,373	2,504	2,536
	Area 3					
D2	Area 4	68	935	1,404	2,509	2,531
	Area 5	86	648	1,115	2,519	2,521
D3	Area 6	50	1,389	1,691	2,497	2,543
	Area 7	85	653	1,125	2,516	2,524
	Area 8	46	1,253	1,765	2,519	2,521

2.3 Staffing Levels

Staffing levels are the number of pilots available to provide piloting services within each area.

In Step 2.b of the ratemaking process, the projected demand in each area is divided by the bridge hour standard and rounded up to estimate the number of pilots needed to meet the projected demand in each area. The Director of Great Lakes Pilotage has the authority to adjust the number of pilots for other circumstances. Since 2008 the number of pilots in Area 2 has been increased to minimize delays and reduce pilot turnover, among other reasons.

No specific concerns have been expressed regarding the number of pilots estimated during the ratemaking process. District 1 (11 pilots) and District 2 (10 pilots) pilot rolls reflect the estimate, while District 3 (14 pilots) is below the estimated 17 pilots.

Staffing levels have two major components that will be addressed in separate sections:

- Significant concern has been expressed regarding the accuracy of projected demand. The leading contributor to the inaccuracy is that projected demand has been based on previous projections rather than baselining to actual demand. Inclusion of historical data will be discussed along with alternatives for calculating averages to project demand.
- Determining the number of pilots needed based on seasonal work standards, discussed in the previous section, and recommended approaches to project demand, discussed in the next section.

2.3.1 Applying an Average to Project Demand

The terms defined in **Section 2.1: Clarifying Terminology** will be used to support this discussion.

Projected demand is the anticipated demand for pilotage service for the following year. To remain consistent with the previous recommendation of separating the use of "Bridge Hour,"

projected demand will be conducted in terms of number of assignments. Speaking in terms of number of assignments provides a direct relationship to the capacity needed for pilots and rates charged to industry.

The application of projected demand currently contributes to two components of the ratemaking process:

- In Step 2.b the projected bridge hours are divided by the bridge hour standard to estimate the number of pilots.
- In Step 3.a the projected bridge hours are multiplied by the previous year's pilotage rate for each area to provide revenue estimation.

Currently the Director of Great Lakes Pilotage uses historical data, input from the pilots and industry, periodicals and trade magazines, and information from conferences to project demand for pilotage services for the coming year. An anticipated increase/decrease was applied to the previous year's projection. This resulted in projections based on previous projections and not on actual circumstances. Any error in the previous year's project demand would be propagated into the next projection.

Projecting demand was consistently identified among stakeholders as the most difficult task to perform, as well as the most important because of its dramatic impact on the rate, number of pilots, and estimations for generating revenue. Criteria for evaluating alternative methodologies for projecting demand are:

- Historically resembles actual demand
- Able to respond to/recover from large fluctuations
- Stabilizes size of pilot workforce
- Provides some stability to rates
- Anticipates changes to the demand

The result of applying an average is to dampen the variations in demand on the Great Lakes. The degree of dampening and the amount of time necessary to respond to changing trends in demand are dependent on the length of historical averaging window used. Pros and cons for each length window are provided in **Table 12: Comparing Sliding Window Averages.**

Table 12: Comparing Sliding Window Averages

Alternatives	Pros	Cons
3-year	• Most responsive to demand trends. • Provides little stability for developing and maintaining the pilot pool.	• Abnormal year will significantly influence average. • Slight delay in responding to changing trends. • Does not account for the partial prior year's demand in projecting the future demand. • Does not account for any forecast of changing conditions for the upcoming year.

Alternatives	Pros	Cons
5-year	• Moderate stability in projection. • Method used by Canadian GLPA and most widely recommended among stakeholders.	• Abnormal year will moderately influence average. • Moderate delay in responding to changing trends in demand. • Does not account for the partial prior year's demand in projecting the future demand. • Does not account for any forecast of changing conditions for the upcoming year. • Provides some stability for developing and maintaining the pilot pool.
7-year	• Most stability in projection. Dampens large fluctuations in demand.	• Abnormal year will slightly influence average. • Significant delay in responding to trends in demand. • Does not account for the partial prior year's demand in projecting the future demand. • Does not account for any forecast of changing conditions for the upcoming year. • Provides good stability for developing and maintaining the pilot pool.
5-year Hybrid Historical	• Accounts for the partial prior year's demand in projecting the future demand. • Considers forecast of demand for upcoming year.	• Abnormal year may influence average. • Moderate delay in responding to changing trends in demand.
3-year Hybrid Historical	• Responsive to demand trends. • Accounts for the partial prior year's demand in projecting the future demand. • Considers forecast of demand for upcoming year.	• Abnormal year may influence average. • Slight delay in responding to changing trends in demand.

Four alternatives to averaging are provided based on two variations: a three-year sliding window average and a hybrid historical average that allows for projection of future demand. The five- and seven-year averages have too much lag in their projections to be considered as alternatives. **Figure 10: Averaging Alternatives** reflects the four alternatives and the time span for each. This example is based on projecting demand for the 2013 season.

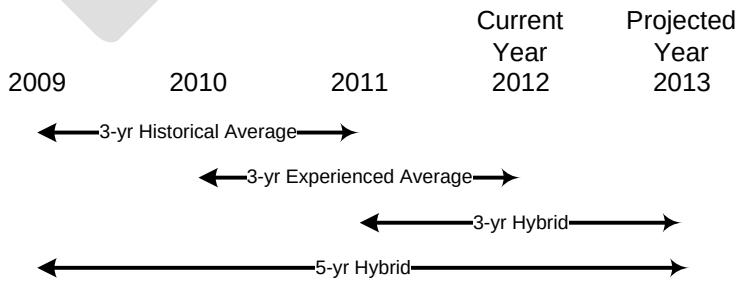


Figure 10: Averaging Alternatives

Alternative 1: Three-year Historical Average

Using just a historical average, the three-year average is recommended. Historically, traffic in the Great Lakes is dynamic. With a longer averaging window, the projected demand will not be as responsive to these trends. With the three-year historical average, the preceding three years to the current year are used to estimate the demand for the year following the current year.

Alternative 2: Three-year Experienced Average

The most recently available years are averaged, including two years preceding the current year, and then demand experienced year to date (YTD) in the current year is compared to the same time the previous year to estimate the percentage increase/decrease of demand over the previous year. The previous year's total demand is then increased by that estimated percentage increase/ decrease.

Alternative 3: Five-year Hybrid Historical Average

The hybrid historical average provides a combination of historical demand to stabilize the projection but incorporates an anticipated adjustment to the average for the upcoming year:

- Three completed years previous to the current year.
- An estimation of the current year based on experienced YTD demand. (See "Three-year Experience Average" above for estimating the current YTD demand.)
- A projection of the percentage increase/decrease in demand over the current year for the projected year. Incorporating this last year into the average allows for some influence of projected business to offset the dampening factor resulting from averaging the other years. Absent any abnormalities in the economy affecting the Great Lakes, it is anticipated these projections will not vary from the current year's demand by more than 5%.

Alternative 4: Three-year Hybrid Historical Average

The three-year hybrid historical average is similar to the five-year hybrid historical average except that only a single complete previous year is averaged with the estimation for the current year and a projection for the following year.

A graph providing a comparison of a three- and five-year historical average to the projections used in past ratemaking processes and a three- and five-year hybrid historical average for the 2013 ratemaking process is provided in **Figure 11: Effects of Applying Historical Averages.** The three- or five-year hybrid historical average was negligible, so only one point is provided; that closely resembles a three-year historical average.

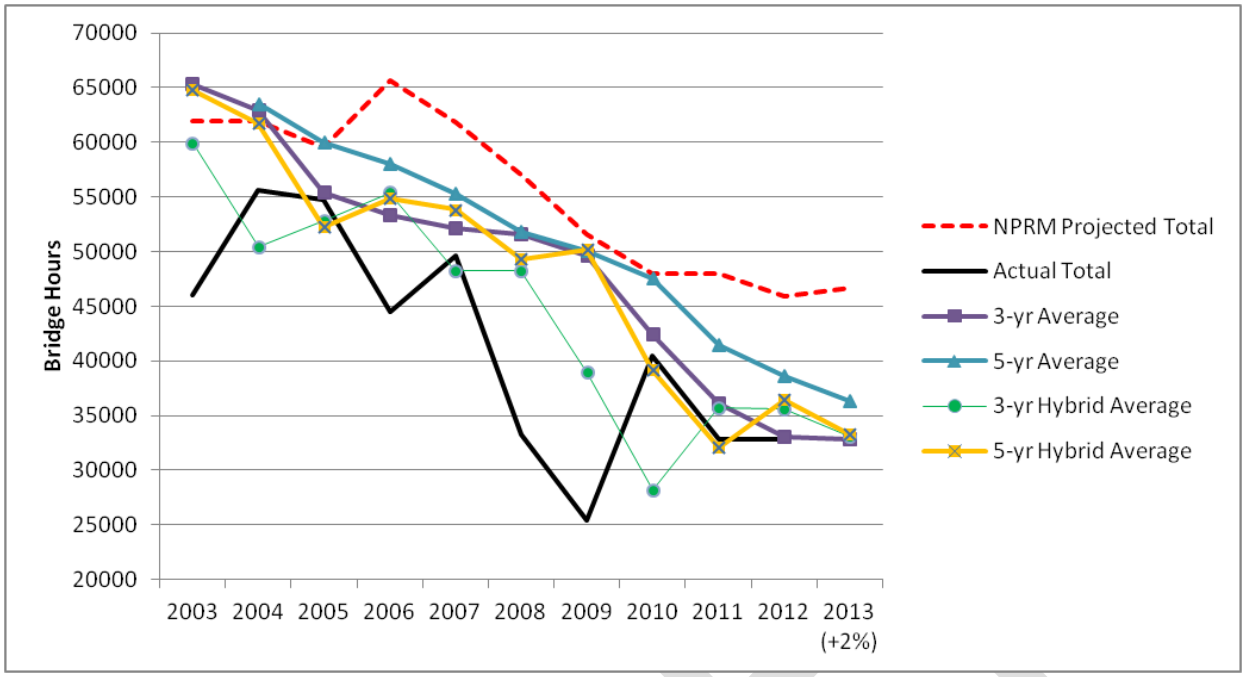


Figure 11: Effects of Applying Historical Averages

A comparison to the 2013 FR projected demand and each alternative is provided in **Table 13: Comparing Historical Averages Alternatives.** In order to calculate the hybrid historical average for the current year, data through September 2012 was used. For the projected demand in 2013, an estimated 2% rise in 2012 demand was estimated. A comparison to the 2013 FR projected demand is provided from two perspectives to account for delays and detentions included in the calculation:

- **Trips –** Staying consistent with the current definition of "Bridge Hour," dividing the 2013 FR projected demand in hours by the average Trip Time of **Table 7: Example Average Pilot Assignment Cycle for Each Area.**
- **Assignments –** Incorporating activities necessary and reasonable to provide pilotage services and dividing the 2013 FR projected demand in hours by the average Time on Assignment.

Table 13: Comparing Historical Averages Alternatives

		2013 FR Projected Demand (Hrs)	2013 FR Projected Demand (Trips)	2013 FR Projected Demand (Assignments)	Alt 1: 3-year Historical Average (Assignments)	Alt 2: 3-year Experienced Average (Assignments)	Alt 3: 5-year Hybrid Historical Average (Assignments)	Alt 4: 3-year Hybrid Historical Average (Assignments)
D1	**Area 1**	5,216	677	448	550	613	581	**629**
	Area 2	5,509	535	349	435	466	437	**451**
	Welland Canal Exclusive to Canadian Pilots							
D2	**Area 4**	6,814	619	412	344	345	363	**342**
	Area 5	5,102	850	494	561	565	606	**565**
D3	**Area 6**	11,411	509	434	433	434	461	**430**
	Area 7	3,223	528	313	275	270	256	**252**
	Area 8	9,540	442	334	221	215	221	**215**

An assessment of these alternatives is provided in **Table 14: Assessment of Applying an Average to Project Demand.** The recommendation is to use a three-year hybrid historical average (Alternative 4).

Table 14: Assessment of Applying an Average to Project Demand

	Alt 1	Alt 2	Alt 3	Alt 4	Risk Statement
Safety					**Risk to Safety**
					N/A
Efficiency/Reliability	-1	-1	1	3	**Risk to Efficiency/Reliability**
					Under-projection will cause too few pilots and potential delays. Need ability to apply some judgment to account for future demand.
Cost	3	3	7	5	**Risk to Cost**
					Over-projection may result in more pilots and increase rates.
Ratemaking Process	9	9	7	7	**Risk to the Ratemaking Process**
					Performing YTD and projecting next year's increase over current year increase complexity and reduce repeatability.
Overall Assessment	11	11	13	15	
Comment: Use of most-recent history regarded as best indicator of the future. Applying a YTD estimation to the current year leverages the most up-to-date information. Including a projection for next year in the average based on economic forecast indicators allows for some leading indicator influence on projecting future demand.					

Recommendation:

- Projected demand should be based on actual demand rather than on previous estimated demand.
- Demand should be stipulated in terms of assignments rather than hours to provide more direct relationship to the services provided and strengthen the relationship between demand, revenue required, pilot capacity, and the tariffs charged.
- A three-year hybrid historical average should be used to provide a balance of historical demand with projected demand for the upcoming year.
- Projections for the forecasted ratemaking year should be benchmarked against available economic forecasts. Chase Bank provides a report on the economic conditions for the Midwest Region,[11] but this report may not be available on a recurring basis. Sources of nationwide economic forecast indicators are also available.[12] Although these may vary from the conditions specific to the Great Lakes, the small variances are mitigated by the fact that the hybrid historical average will be influenced predominantly by the inclusion of the two years' previous historical traffic.

The impact of using a hybrid historical average on the number of pilots estimated for the 2013 FR is show in **Table 15: Example Impact of Hybrid Historical Average on Number of Pilots.** The projected number of assignments for each area is divided by the expected number of assignments per pilot from **Table 11: Example 50% Expected Pilot Utilization** to estimate the number of pilots.

Table 15: Example Impact of Hybrid Historical Average on Number of Pilots

		2013 FR Estimated Pilots Needed	Example 3-yr Hybrid Historical Average 2013 Demand (Assignments)	Example Pilots Needed (50% Efficiency)
D1	Area 1	5.2	629	6.6
	Area 2	3.1	451	6.1
	Welland Canal Exclusive to Canadian Pilots			
D2	Area 4	3.8	330	7.3
	Area 5	5.1	562	7.9
D3	Area 6	6.3	426	8.2
	Area 7	3.2	223	4.9
	Area 8	5.3	205	7.6

[11] https://www.chase.com/online/commercial-bank/document/Midwest.pdf

[12] Examples are http://online.wsj.com/public/page/economic-forecasting.html, and www.kiplinger.com/tool/business/T019-S000-kiplinger-s-economic-outlooks/. Subscription to a monthly service is also available at www.consensuseconomics.com.

Performing the comparison without adjusting the seasonal work standard or definition of bridge hours gives the appearance that significantly more pilots are necessary in some areas. **Section 4: Recommendations** discusses the inter-relationship among the collection of recommendations.

2.3.2 Estimating the Number of Pilots

The number of pilots establishes the capacity to meet projected demand. Currently the number of pilots is estimated in Step 2.b by dividing the projected bridge hours by the bridge hour standard (1,800 for undesignated waters/1,000 for designated waters).

In 2011, only 27 delays due to pilotage are recorded, for a total of 161 hours (of the approximate total bridge hours of 32,800 – less than 0.5%). Operating costs for vessels on the Great Lakes are reported to be in the area of $30K–$50K a day. The total delay due to pilotage over the 2011 season equates to 6.7 days, or $201K–$335K cost to the shipping industry. These low statistics were validated by discussions with stakeholders, who reported that pilotage delay (delay waiting for a pilot to arrive) is not an issue.

However, the pilots have reported issues with workload, fatigue, and interruptions with scheduled time off. The discussion in **Section 2.2: Seasonal Work Standard** addresses workload and fatigue issues in establishing a seasonal work standard and provides a recommendation for the expected number of assignments per pilot, accounting for activities associated with delivering pilotage services.

It may be necessary to increase the number of pilots in order to meet demand and reduce the probability of pilots being recalled on scheduled time off. The discretionary authority of the Director permits a variance in the number of pilots assigned. An analysis of surge demand (concurrent assignments) provides insights into interruptions with scheduled time off and the need to adjust the efficiency factors by District to arrive at appropriate staffing levels. Adjustment to the efficiency factors is based on an analysis of the demand from the most recent historical data from the Klein system.

Whisker diagrams for jobs per day experienced in 2011 are provided in **Appendix C.3** and illustrate days in which the number of jobs processed that day exceeds the number of pilots on the Tour de Role and, in some case, the total number of pilots in the District. These diagrams also show that there are some days during the season where no assignments are executed throughout the District.

It was determined from the data that the distribution of the number of jobs per day performed within each District follows a Poisson distribution (see **Figure 12: 2011 Distribution of Jobs/Day)**. Approximating the distribution allows for calculating the cumulative distribution function to determine how many pilots are necessary to respond to 90% of experienced demand.

A distribution of the number of jobs per day within each District was determined from the 2011 Klein system data and is provided in **Figure 12**. A Poisson distribution is superimposed on the figure with dotted lines. The average used in the Poisson distribution was adjusted so that the calculated distribution most closely aligned with the actual distribution in the area of interest.[13]

[13] The cumulative distribution function prior to the area of interest will be equivalent up to that point, even though the probability density functions are not exact prior to the area of interest.

The Poisson cumulative distribution function was then calculated using this average to determine how many pilots would be necessary to meet 90% of the experienced demand.

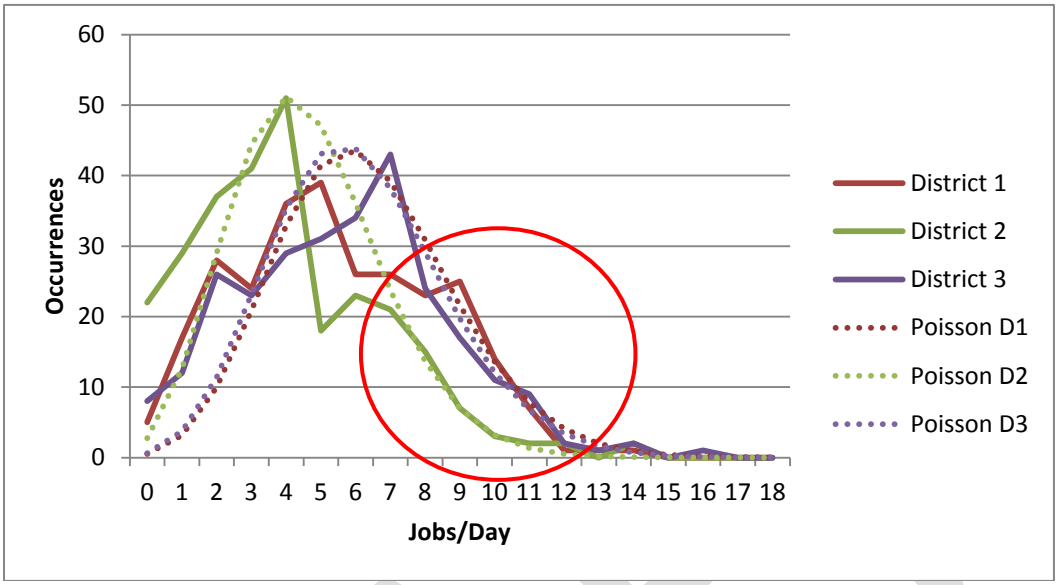


Figure 12: 2011 Distribution of Jobs/Day

Three alternatives were evaluated to tailor the efficiency factor discussed in **Section 2.2: Seasonal Work Standard** to meet 90% of the demand and are summarized in **Table 16: Example Staffing Level Alternatives**. From the estimated cumulative distribution function, the number of pilots needed to meet 90% of the jobs/day demand was determined. An average number of pilots on scheduled time off was determined by multiplying the number of pilots required by the recommended 10 days of scheduled time off each month. The total number of scheduled days off was then divided by 30 days in the month to approximate how many pilots, on average, would be on scheduled time off each day of the month. The number of pilots remaining on the Tour de Role must be sufficient to meet 90% of the jobs/day demand. A 50% Efficiency Factor does not provide a sufficient number of pilots and the probability of recall from scheduled time off is increased. A 40% efficiency factor exceeds the number of pilots needed in some Districts. An efficiency factor that varies for each District provides a sufficient number of pilots to cover 90% of the experienced demand.

Table 16: Example Staffing Level Alternatives

	District 1	District 2	District 3
Number of Jobs/Day 90% of Demand	9	7	9
Alternative 1: 50% Efficiency Factor			
Pilots Authorized	11.4	9.1	12.5
Total Scheduled Time Off (days/mo)	114	91	125
Average Pilots on STO (pilots/day)	3.8	3.0	4.2
Pilots Available on Tour de Role	7.6	6.1	8.3

	District 1	District 2	District 3
Alternative 2: 40% Efficiency Factor			
Pilots Authorized	14.2	11.4	15.6
Total Scheduled Time Off (days/mo)	142	114	156
Average Pilots on STO (pilots/day)	4.7	3.8	5.2
Pilots Available on Tour de Role	9.5	7.6	10.4
Alternative 3: Tailored Efficiency Factor			
Efficiency Factor	42%	43%	46%
Pilots Authorized	13.6	10.6	13.6
Total Scheduled Time Off (days/mo)	136	106	136
Average Pilots on STO (pilots/day)	4.5	3.5	4.5
Pilots Available on Tour de Role	9.1	7.1	9.1

This example calculation was completed with the available jobs per day data in the Klein system. Improvements to data in the Klein system would permit the identification of maximum concurrent Pilot Assignment Cycles in a day (rather than jobs per day), which is more representative of the demand and a basis for estimating how many pilots should be maintained on the Tour de Role each day. The Pilot Assignment Cycle includes mandatory rest, which is not recorded in the Klein system. The use of concurrent Pilot Assignment Cycles rather than jobs per day will cause a decrease in the expected current demand and allow for an increase in the efficiency factor to meet 90% of the demand – resulting in lower staffing levels.

An assessment of these alternatives is provided in **Table 17: Assessment of Staffing Level Alternatives.** The recommendation is to apply a tailored efficiency factor when calculating staffing levels (Alternative 2).

Table 17: Assessment of Staffing Level Alternatives

	Alt 1	Alt 2	Alt 3	Risk Statement
Safety	2	4	6	**Risk to Safety**
				Sufficient pilots provide for a reasonable workload and avoid fatigue. Too many pilots may result in excess capacity.
Efficiency/Reliability				**Risk to Efficiency/Reliability**
				N/A
Cost	2	0	4	**Risk to Cost**
				Personnel costs largest contributor to overall costs. Too many pilots impact individual wages.
Ratemaking Process	4	4	0	**Risk to the Ratemaking Process**
Overall Assessment	8	8	10	

A review of data from 2008 to 2011 for maximum pilot utilization supports the assumption that fewer pilots may be able to meet the demand. A listing of the maximum overlapping jobs assigned to U.S. pilots, along with the date that maximum occurred, is provided in **Table 18:**

Historical Maximum Concurrent Jobs for U.S. Pilots. Based on the Klein system data, each area has sufficient pilots authorized to cover the maximum demand experienced in 2008–2011. Although the number of pilots was exceeded in Areas 4 and 7 (yellow highlighting), a flexible undesignated/designated waters assignment policy allows them to respond to surge demand in a particular area. For these dates, a maximum occurred in one area on a different date than in the other area. Not visible in the available data, however, is how many times a pilot may have been recalled from scheduled time off to meet the demand. This information should be recorded in the Klein system to monitor its occurrence and support decisions to vary the number of pilots or the efficiency factor associated with the seasonal work standard.

Table 18: Historical Maximum Concurrent Jobs for U.S. Pilots

		2011			2010			2009			2008		
		Pilots Authorized	Maximum Overlapping Jobs	Date(s)	Pilots Authorized	Maximum Overlapping Jobs	Date(s)	Pilots Authorized	Maximum Overlapping Jobs	Date(s)	Pilots Authorized	Maximum Overlapping Jobs	Date(s)
D1	**Area 1**	6	4	7/13, 7/31	6	6	12/21	6	4	4/9	6	4	6/3, 9/2, 10/6, 10/9, 11/21
D1	**Area 2**	5	5	11/24	5	4	5/3, 6/20, 7/31, 11/28, 12/4	5	4	11/20	5	4	9/29
	Area 3	***Welland Canal Exclusive to Canadian Pilots***											
D2	**Area 4**	4	4	10/22, **12/10**	4	5	11/29	4	3	4/9, 10/11	4	8	**4/16**
D2	**Area 5**	6	4	6/6, 11/10, **12/10**	6	5	12/18	6	5	7/24	6	6	**4/16**
D3	**Area 6**	7	7	11/2	7	5	9/7, **11/19**	7	6	11/25, 12/6	7	5	5/28, 10/23
D3	**Area 7**	4	4	12/9	4	4	**11/18**, 12/2, 12/8	4	6	4/16	4	6	12/9
D3	**Area 8**	6	4	5/26, 11/7, 12/6	6	5	9/4, 11/20	6	4	4/14	6	4	4/15, 10/2, 11/25

In District 2 on April 16, 2008, the maximum number of concurrent jobs occurred in both Area 4 and Area 5 on the same day. A full listing was reviewed to determine whether pilot capacity was exceeded on that day, resulting in pilotage delay. It was found that double pilotage was used on every ship that day. A few jobs were completed early in the morning of the 16th, which allowed those pilots to take on another assignment that day. Although sufficient pilots were available to meet demand, assignments were lengthy and some delays were encountered, as shown in **Table**

19: District 2 Maximum Assignments 16 April 2008. This accounts for all 10 pilots in District 2 during that day, so it is likely someone was recalled from scheduled time off to meet this demand.

Table 19: District 2 Maximum Assignments 16 April 2008

Vessel	From-To Locations	Start-End Times	Pilots	Reported Delay
Whistler	SES to Detroit	1845 (15th)–0630	Pilot 2C/Pilot 2D	6.33 hours (other)
Isa	Detroit Pilot Boat to B12	2145 (15th)–0345	Pilot 2E/Pilot 2J	
Marlene Green	Port Colborne to SES	2315 (15th)–0930	Pilot 2A/Pilot 2G	
	SES to Detroit Pilot Boat	0930-1400	Pilot 2A/Pilot 2G	
	Detroit Pilot Boat to B12	1400-1945	Pilot 2A/Pilot 2G	
Stellanova	Erie to Port Colborne	1200–1915	Pilot 2F/Pilot 2I	2.92 hours (other)
Tuscarora	Toledo to SES	1430–2015	Pilot 2B/Pilot2H	1.25 hours (other)
	SES to Port Colborne	2015–0745 (17th)	Pilot 2B/Pilot2H	
Yosemite	Port Colborne to Lorain	1545–1135 (17th)	Pilot 2E/Pilot 2J	
Federal Power	Detroit to SES	1600–2150	Pilot 2C/Pilot 2D	1.25 hours (other)
	SES to Port Colborne	2150–0850 (17th)	Pilot 2C/Pilot 2D	
Federal Seto	Port Colborne to Ashtabula	1915–0735 (17th)	Pilot 2F/Pilot 2I	1.08 hours (other)

Recommendation:

- Use the projected assignments divided by the expected number of assignments per pilot to estimate the number of pilots needed. For initial estimation, use a 50% efficiency factor when determining the expected number of assignments per pilot.
- Determine the number of concurrent Pilot Assignment Cycles each day from the most recently available data, and verify that sufficient pilots will be available on the Tour de Role to respond to 90% of the demand.
- Tailor the efficiency factor to meet 90% of the experienced demand.

2.4 Billing Scheme

The billing scheme is the method by which pilot fees are assessed against work provided by pilots onboard vessels transiting through the Great Lakes Region. Within the current system, the billing schemes vary based on the type of work provided and the location of the work within the system. **Table 20: Billing Schemes Overview** provides a listing and an assessment of the various billing schemes that are used in the current ratemaking process.

Table 20: Billing Schemes Overview

Billing Scheme/ Example of Current Use	Description	Pros	Cons	Mitigating Strategies
Mileage: Used for pilotage on St. Lawrence River (designated waters of District 1)	A specific dollar per distance. The distance for each trip is tracked and multiplied by the tariff-per-mile.	• Fixed cost that can be calculated.	• Incentive to rush transit. • No latitude for unexpected environmental or traffic delays. • May not recover overhead costs associated with a job.	• Monitor speed and set a minimum time. • Reflect probability of longer time in the tariff. • Use only in areas where transit time is consistent. • Allow for a minimum charge (to recover overhead).
6-Hour Period: Used for pilotage in undesignated waters	A specific dollar per 6-hour trip unit. The time required for each trip is recorded. The time is divided by 6-hours and rounded up to calculate the number of 6-hour units required to complete the trip. The number of 6-hour units is multiplied by the dollar per 6-hour trip charge.	• Allows for recovery of fixed costs.	• Large cost for minimally exceeding 6-hour limit. • Incentive to extend trip.	• Establish number of 6-hour periods permitted for various legs. • Set tariffs for individual hours in excess of the first 6-hour period or the agreed-to number of 6-hour periods for a leg.
Point-to-Point Charges: Used for pilotage in designated waters of Districts 2 and 3	Each unique combination of trip endpoints is defined as a specific charge.	• Fee can be tailored to match the complexity and general conditions (travel time) of the leg.	• Each leg needs to be enumerated; list may get long. • Incentive to rush transit.	• Monitor speed, and set a minimum time. • Generalize endpoints (e.g., Port Colborne to any point west of Southeast Shoal).
Flat Charge per Assignment in Area: Used for movage and docking/undocking	Each trip with in an Area has the same charge regardless of the start and end locations.	• Easy to implement.	• Wide variety of length of jobs within an area. • Does not accommodate extenuating circumstances. • Incentive to rush transit.	• Reflect distribution of length of trip in the tariff. • Monitor travel speed.

Billing Scheme/ Example of Current Use	Description	Pros	Cons	Mitigating Strategies
Hourly Billing: Used as penalty charge for delay, detentions, and cancellations	A specific dollar per hour. The time required for each trip is recorded and multiplied by the dollar-per-hour trip charge.	• Accommodates transit modifications. • Billing is directly correlated to the expense. • Encompasses detention and delay times.	• Incentive to extend the trip. • May not recover overhead costs associated with executing a job.	• Allow for a minimum charge (to recover overhead). • Monitor travel time between points for abnormalities.
Additional charges apply for delay and detention as in 46 CFR 401.420:				
Delay	When the departure or movage of a ship for which a U.S. pilot has been ordered is delayed for the convenience of the ship for more than one hour after the U.S. pilot reports for duty at the designated boarding point or after the time for which the pilot is ordered, whichever is later, the ship shall pay an additional charge calculated on a basic rate of $124 for each hour or part of an hour, including the first hour of the delay, with a maximum basic rate of $1,942 for each continuous 24-hour period of the delay.			
Interruption or Detention	The ship shall pay an additional charge calculated on a basic rate of $124 for each hour or part of an hour during which each interruption or detention lasts, with a maximum basic rate of $1,942 for each continuous 24-hour period during which the interruption or detention continues. There is no charge for an interruption or detention caused by ice, weather, or traffic, except during the period beginning the 1st of December and ending on the 8th of the following April. No charge may be made for an interruption or detention if the total interruption or detention ends during the 6-hour period for which a charge has been made.			
Cancellation	• A cancellation charge calculated on a basic rate of $733; • A charge for reasonable travel expenses if the cancellation occurs after the pilot has commenced travel; and • If the cancellation is more than one hour after the pilot reports for duty at the designated boarding point or after the time for which the pilot is ordered, whichever is later, a charge calculated on a basic rate of $124 for each hour or part of an hour, including the first hour, with a maximum basic rate of $1,942 for each 24-hour period.			

Concerns related to the billing scheme expressed by stakeholders include:

- Industry ordering ships to slow down for fuel conservation or pier availability reasons, creating a greater consumption of pilot capacity.
- Pilots delayed/detained for the convenience of industry.
- The rate for delay/detention is capped at an equivalent maximum of 15.6 hours within a 24-hour period (i.e., there is no compensation for consuming pilot capacity for the potential remaining 8.4 hours of detention in the 24-hour day).
- The complexity of estimating piloting costs.

Three components of developing a recommended billing scheme were considered:

- Establishing standard transit times to manage the amount of capacity consumed for the services delivered;
- Additional charges for exceeding the standard transit time; and
- A Time on Bridge factor to compensate for when the pilot is not on the bridge as much in undesignated waters.

Establish Time Standard

Conservation and intelligent use capacity is critical to an efficient pilot system. Applying time standards to transits of vessels will provide a single means for establishing tariffs.

Establishing time standards assists in effectively planning and utilizing pilot capacity. The standards provide a baseline to identify those situations in which a transit has been prolonged and assess additional fees if necessary. The standards should be established to account for normal variances in traffic and not cause undue pressure in meeting timelines and placing the safety of the vessel at risk.

To compensate for variances in traffic and not impose risk in rushing the passage of vessels to avoid an additional charge for slow moving vessels, in this example the hourly standard was increased by one standard deviation. If the vessel is not delayed beyond this standard transit time for "convenience to the ship," then no additional charges will be assessed. Only when the vessel exceeds the standard transit time for "convenience of the ship" will the additional charge be assessed.

The transit times determined in this section are established to identify when a ship should be considered a slow moving vessel and imposed an additional charge for consuming additional pilot capacity. The Trip Time used in the examples in **Section 2.2: Seasonal Work Standard** is used to calculate pilot capacity and are based on an average trip length. To illustrate the balance in the calculations, in the event the ship's average transit increases over time, the Trip Time also will increase. This will lengthen the Pilot Assignment Cycle and decrease the number of assignments a pilot is estimated to complete. This will result in an increase the number of pilots to meet demand.

Two different standards were identified – hourly transit times and six-hour-block times.

Alternative 1: Standard Hourly Transit Times

A set of example standard hourly transit times were determined from 2011 Klein system data. Jobs for 2011 were characterized to identify a set of transit definitions that covered all assignments. From those definitions, average transit times and standard deviation were computed (See **Appendix C** for specific data). These average times compensate for dockage/undockage at either end, so the pilot capacity for these evolutions is accounted for within the average. A separate charge for these events is no longer necessary – pilot capacity is the chargeable unit and part of the average transit time. To illustrate establishing a standard, the sum of the average transit time and one standard deviation was rounded to the nearest hour to determine the Standard Hourly Transit Time.

Alternative 2: Six-Hour-Block Standard Times

Six-hour blocks were determined by dividing the Standard Hourly Transit Time, as defined above, by 6 and rounding to the nearest whole six-hour block. This approach is not recommended, as the six-hour block did not provide enough granularity, and the rounding too often spanned a three-hour gap.

The enumeration of the transits and the standard transit times, in both hourly and six-hour-block standards, is presented in **Table 21: Example Standard Hourly Transit and Six-Hour Blocks.** The transit definitions identify the endpoints or areas of each transit. This set of transit definitions spans only those jobs performed in the 2011 Klein system data. A more comprehensive listing of transit definitions is provided in **Appendix C**.

Table 21: Example Standard Hourly Transit and Six-Hour Blocks

Transit Definition	Alt 1: Standard (hrs)	Alt 2: 6-Hr Blocks
Area 1		
Snell & Cape Vincent	14	2
Movage	2	1
Area 2		
Cape Vincent & Western Ontario Port	16	3
Cape Vincent & Port Weller	13	2
Port Weller & Western Ontario Port	5	1
Western Ontario Port Change	7	1
Movage	2	1
Area 4		
Port Colborne& Southeast Shoal	15	3
Port Colborne & Erie	7	1
Port Colborne & Ashtabula	10	2
Port Colborne & Cleveland	15	3
Southeast Shoal & Cleveland	8	1
Southeast Shoal & Ashtabula	7	1
Southeast Shoal & Erie	8	1
Movage	2	1

Transit Definition	Alt 1: Standard (hrs)	Alt 2: 6-Hr Blocks
Area 5		
Toledo or any Point on Lake Erie W. of Southeast Shoal & Detroit River	9	2
Toledo or any Point on Lake Erie W. of Southeast Shoal & Detroit Pilot Boat	8	1
Port Huron Change Point & Detroit River	12	2
Port Huron Change Point & Detroit Pilot Boat	9	2
Detroit, Windsor, or Detroit River & Southeast Shoal	6	1
Detroit Pilot Boat & Southeast Shoal	6	1
Toledo or any Point on Lake Erie W. of Southeast Shoal & Southeast Shoal	10	2
Movage	3	1
Area 6		
B12 & Goderich, ON	15	3
B12 & Little Current, ON	27	5
B12 & DeTour, Cheboygan, or Mackinac	17	3
B12 & Green Bay, Menominee, or Sturgeon Bay	47	8
B12 & Milwaukee	42	7
B12 & Southern Lake Michigan	61	10
Within DeTour, Cheboygan, or Mackinac	6	1
DeTour, Cheboygan, or Mackinac & Milwaukee	25	4
DeTour, Cheboygan, or Mackinac & Green Bay, Menominee, or Sturgeon Bay	36	6
DeTour, Cheboygan, or Mackinac & Traverse City	10	2
DeTour, Cheboygan, or Mackinac & Southern Lake Michigan	29	5
DeTour, Cheboygan, or Mackinac & Tobermory, ON	12	2
DeTour, Cheboygan, or Mackinac & Little Current, ON	30	5
Goderich, ON & DeTour, Cheboygan, or Mackinac	15	3
Goderich, ON & Green Bay, Menominee, or Sturgeon Bay	34	6
Goderich, ON & Southern Lake Michigan	42	7
Traverse City & Southern Lake Michigan	24	4
Tobermory, ON & Little Current, ON	5	1
Milwaukee & Green Bay, Menominee, or Sturgeon Bay	28	5
Green Bay, Menominee, or Sturgeon Bay & Southern Lake Michigan	25	4
Milwaukee & Southern Lake Michigan	15	3
Within Southern Lake Michigan	6	1
Movage	12	3
Area 7		
Gros Cap & DeTour	10	2
Sault Ste. Marie, MI & DeTour and any point in between	13	2
Sault Ste. Marie, MI & Gros Cap	13	2
Movage	4	1
Area 8		
Gros Cap & Thunder Bay	18	3
Gros Cap & Duluth or Superior	31	5
Duluth or Superior & Thunder Bay	22	4
Movage	4	1

To minimize the transit point listing, some transits have been combined with "and all points in between" approach, as appropriate. For example, in Area 7 this was done to account for a single stop in Hay Lake Anchorage. Ports associated with each grouping are listed in **Table 22: Combined Transit Definitions.**

Table 22: Combined Transit Definitions

Transit Definition	Included Ports
Snell & Iroquois	• Prescott
Iroquois & Cape Vincent	• Alexandria Bay
Western Ontario Ports	• Hamilton • Toronto • Clarkson • Oshawa • Bronte • Oakville
Cleveland	• Lorain
Erie Pilot Boat	• Colchester
B12	• Port Huron Anchorage
Southern Lake Michigan	• Chicago • Burns Harbor

Additional Charges for Exceeding the Standard

Exceeding the standard transit time will consume additional pilot capacity and delay the pilot from being able to perform a subsequent assignment. Exceeding the time standard can occur in two situations:

- **Delay caused by ice, weather, or traffic.** In these circumstances, safe navigation of the vessel is paramount, and additional charges could be made at the average hourly rate. For example, if the standard transit time is 10 hours and the rate is established at $1,000, then each additional hour would be charged at $100 an hour – the average hourly rate.
- **Delay for the convenience of the ship.** In this circumstance, there is an advantage to the ship, but more pilot capacity is being consumed. In this situation, an additional charge should be assessed. An example in this circumstance would be the average hourly charge for the transit plus the hourly charge for delay. For example, a standard 10-hour transit and $1,000 rate would result in the $100 per hour average plus $124 per hour (the current delay rate) for a total of $224 for each hour beyond the established standard assessed only when the delay is caused by the convenience of the ship (i.e., delays not caused by ice, weather, traffic, or for safe navigation of the vessel).

Undesignated/Designated Waters Differentiator

The current billing scheme assesses tariffs based on six-hour blocks in undesignated waters. The tariff in undesignated waters is significantly lower than designated waters even though the same amount of pilot capacity is consumed. For example, the rates established by the 2013 Final

Ruling assess $828 for each 6-hour block in Area 4. The trip from Port Colborne to Southeast Shoal averages 12.3 hours resulting in a maximum total charge of $2,484. A trip from Southeast Shoal to the Detroit Pilot Boat ($1,693/5.2 hours average) and from the Detroit Pilot Boat to Port Huron ($2,381/6.5 hours average) totals $4,074 for an average total trip length of 11.7 hours. This is a large difference in revenue generated despite a similar amount of pilot capacity being consumed.

The recommendation is that a more homogeneous perspective across pilot services be taken that reflects equity across pilots and the services they provide. This simplifies the tariff structure and determination of tariffs by breaking it down to a single component – the amount of pilot capacity consumed. **Section 3.2.4: Baseline Tariffs** discusses the procedures to generate tariffs based on traffic demand, compensating for weighting factors for pilotage units, and optionally including a factor for undesignated/designated waters.

Criteria for Assessment

The criteria that are being used to assess the billing schemes are listed as follows:

- **Safety –** Whether the billing scheme promotes unsafe operations (e.g., excess speed in hazardous conditions).
- **Efficiency –** No advantage to imposing delay in moving vessels through the system and assessment of appropriate penalties for consuming pilot capacity.
- **Predictability of cost –** A reasonable estimate can be made despite potential delays.

These criteria are reflected in the pros/cons of the current billing scheme provided in **Table 20: Billing Schemes Overview.** An assessment of the alternatives for hourly or six-hour blocks is provided in **Table 23: Assessment of Billing Scheme.** The recommendation is to use a Standard Hourly Transit Time (Alternative 1). The Standard Hourly Transit Time would be benchmarked against the average transit time plus some variance to establish a point where additional charges can be assessed for delays caused by the convenience of the ship.

Table 23: Assessment of Billing Scheme

	Alt 1	Alt 2	Risk Statement
Safety	3	1	**Risk to Safety**
			No risk to rush assignments.
Efficiency/Reliability	3	1	**Risk to Efficiency/Reliability**
			Incentive to keep vessels moving through the system.
Cost	0	0	**Risk to Cost**
			Additional costs for not meeting standards.
Ratemaking Process	-1	-1	**Risk to the Ratemaking Process**
			Transit definitions and standards need to be updated every 3 to 5 years.
Overall Assessment	**5**	1	

Recommendation:

- Establish a set of standard transits and Standard Hourly Transit Times for each area as the basis for a new pilotage billing scheme. The standard hourly time reflects a tariff structure based on the amount of pilot capacity consumed.
- Annually review the tariffs to verify they reflect experienced traffic density, and re-baseline as appropriate (discussed further in **Section 3.2.4: Baselined Tariffs**).
- If a ship exceeds the standard time for convenience of the ship, additional hours will be at the average hourly rate for that transit plus the hourly rate of detention. For example, if the standard transit time is five hours and the proposed rate is $1,807, the average hourly rate is $361. The detention charge is currently $124 per hour. The ship would be charged $485 for each hour beyond the standard transit time. This additional penalty will balance the decision for the ship to consume more of a pilot's time than necessary. There would be no additional charge for an interruption or detention caused by ice, weather, or traffic.
- Any delays caused by ice, weather, traffic, or the safe navigation of the ship would only be assessed an average hourly rate ($361/hr from the example) if the Standard Hourly Transit Time is exceeded.
- The maximum charge for a 24-hour period for delay or detention should be increased to encompass the entire 24-hour period the pilot is delayed or detained – not capped at a maximum 24-hour amount equivalent to only 15.6 hours. This will account for pilot capacity consumed.

It is not recommended that the tariffs differentiate between undesignated and designated waters. Pilot capacity is consumed in both cases and the cost of an hour of pilot capacity is equal regardless of whether that capacity is consumed on undesignated or designated waters.

As an example, a notional set of tariffs was generated using the Standard Hourly Transit Time, the distribution of traffic in 2011, and the revenue required as reported in the 2013 FR. The Standard Hourly Transit Times were defined in **Table 21: Example Standard Hourly Transit and Six-Hour Blocks.** A step-by-step application of this process is delineated in **Section 3.2.4: Baselined Tariffs,** where a recommendation to re-baseline the tariffs on a regular basis is made to compensate for shifting traffic distributions.

In order to estimate the cost of pilot capacity expended on each transit, a notional hourly rate for pilot capacity is multiplied by the Standard Hourly Transit Time. To determine a notional hourly rate for pilot capacity, the total revenue required is divided by the aggregate number of hours spent providing pilotage services in a District. The aggregate total hours are weighted by the weighting factor for pilotage units to account for the distribution of different sizes of vessels and the tariff weighting factor associated with each. The pilotage units recorded in the 2011 Klein system data were used to in these calculations. For a given transit, the number of occurrences for each vessel size is multiplied by the Standard Hourly Transit Time and summed together, resulting in total weighted hours for that transit. Movages are not included in determining the total aggregate hours because of their variability and should not be included in plans to recover revenue. All transits in the District are then summed to determine the aggregate total weighted hours in the District. This is divided into the total revenue required by the District to obtain the revenue that needs to be recovered for each hour of pilot capacity. The hourly rate was

multiplied by the standard transit time to determine a notional tariff for each transit. If traffic distribution is unchanged, the required revenue will be generated based on the summation of all transits weighted by the pilotage unit factor.

A comparison of example tariffs and the 2013 FR tariffs is provided **Table 24: Standard Hourly Tariff Example.** The Example Tariff is determined through the process above. This tariff reflects an equivalent cost for pilot capacity in both undesignated and designated waters. The Example Weighted Bridge Time scales hours associated with transits in undesignated waters by 50% so that the tariff calculated for an hour of pilot capacity in undesignated waters is 50% less than an hour of pilot capacity in designated waters. Information provided by the pilots indicated an estimate of 50% of the time in undesignated waters is spent on the bridge. More detailed estimates could be obtained if this scaling factor is used.

A comparison to the cost of each transit based on 2013 FR tariffs is also provided. For 2013 FR tariffs in undesignated waters, the number of 6-hour blocks from **Table 21: Example Standard Hourly Transit and Six-Hour Blocks** was multiplied by the 6-hour tariff charge published in the 2013 FR. For undesignated waters, a movage was charged as two dockage fees from the 2013 FR.

In some areas, significant variance from the 2013 FR tariff occurs because of the determination of example tariffs based on the distribution of the traffic and the length of the transit. In general, the example tariffs are higher because they are based on the actual 2011 aggregate hours from the Klein system, whereas the 2013 FR tariffs are based on projected demand. (See **Section 2.3.1: Applying an Average to Project Demand** for a discussion on the large difference between projected demand and actual demand.)

Table 24: Standard Hourly Tariff Example

Transit Definition	Alt 1 Standard (hrs)	Example Tariff	Example Weighted Bridge Time Tariff	2013 FR Tariff
Area 1				
Snell & Cape Vincent	14	$3,946	$5,250	$3,984[14]
Movage	2	$564	$750	$1,361
Area 2				
Cape Vincent & Western Ontario Port	16	$4,510	$3,000	$2,553
Cape Vincent & Port Weller	13	$3,665	$2,438	$1,702
Port Weller & Western Ontario Port	5	$1,409	$938	$851
Western Ontario Port Change	7	$1,973	$1,313	$851
Movage	2	$846	$1,125	$1,624
Area 4				
Port Colborne & Southeast Shoal	15	$5,106	$3,331	$2,484
Port Colborne & Erie	7	$2,383	$1,555	$828
Port Colborne & Ashtabula	10	$3,404	$2,221	$1,656
Port Colborne & Cleveland	15	$5,106	$3,331	$2,484

[14] There is a maximum charge limit for this transit.

Transit Definition	Alt 1 Standard (hrs)	Example Tariff	Example Weighted Bridge Time Tariff	2013 FR Tariff
Southeast Shoal & Cleveland	8	$2,723	$1,777	$828
Southeast Shoal & Ashtabula	7	$2,383	$1,555	$828
Southeast Shoal & Erie	8	$2,723	$1,777	$828
Movage	2	$681	$888	$1,274
Area 5				
Toledo or any Point on Lake Erie W. of Southeast Shoal & Detroit River	9	$3,064	$3,997	$3,037
Toledo or any Point on Lake Erie W. of Southeast Shoal & Detroit Pilot Boat	8	$2,723	$3,553	$2,339
Port Huron Change Point & Detroit River	12	$4,085	$5,330	$3,060
Port Huron Change Point & Detroit Pilot Boat	9	$3,064	$3,997	$2,381
Detroit, Windsor, or Detroit River & Southeast Shoal	6	$2,042	$2,665	$2,339
Detroit Pilot Boat & Southeast Shoal	6	$2,723	$3,553	$1,693
Toledo or any Point on Lake Erie W. of Southeast Shoal & Southeast Shoal	10	$3,404	$4,442	$2,339
Movage	3	$1,021	$1,332	N/A
Area 6				
B12 & Goderich, ON	15	$1,746	$1,707	$1,375
B12 & Little Current, ON	27	$3,156	$3,011	$2,073
B12 & DeTour, Cheboygan, or Mackinac	17	$5,680	$5,420	$3,455
B12 & Green Bay, Menominee, or Sturgeon Bay	47	$3,577	$3,891	$2,073
B12 & Milwaukee	42	$9,888	$10,379	$5,528
B12 & Southern Lake Michigan	61	$8,836	$8,432	$4,837
Within DeTour, Cheboygan, or Mackinac	6	$12,834	$10,531	$6,910
DeTour, Cheboygan, or Mackinac & Milwaukee	25	$1,262	$1,205	$691
DeTour, Cheboygan, or Mackinac & Green Bay, Menominee, or Sturgeon Bay	36	$5,260	$5,019	$2,764
DeTour, Cheboygan, or Mackinac & Traverse City	10	$7,574	$7,227	$4,146
DeTour, Cheboygan, or Mackinac & Southern Lake Michigan	29	$2,104	$2,008	$1,382
DeTour, Cheboygan, or Mackinac & Tobermory Canada	12	$6,101	$5,822	$3,455
DeTour, Cheboygan, or Mackinac & Little Current Canada	30	$2,525	$2,409	$1,382
Goderich, ON & DeTour, Cheboygan, or Mackinac	15	$6,312	$6,023	$3,455
Goderich, ON & Green Bay, Menominee, or Sturgeon Bay	34	$3,156	$3,011	$2,073
Goderich, ON & Southern Lake Michigan	42	$7,153	$6,826	$4,146
Traverse City & Southern Lake Michigan	24	$8,836	$8,432	$4,837
Tobermory, ON & Little Current, ON	5	$5,049	$4,818	$2,764
Milwaukee & Green Bay, Menominee, or Sturgeon Bay	28	$1,052	$1,004	$691
Green Bay, Menominee, or Sturgeon Bay & Southern Lake Michigan	25	$5,891	$5,621	$3,455

Transit Definition	Alt 1 Standard (hrs)	Example Tariff	Example Weighted Bridge Time Tariff	2013 FR Tariff
Milwaukee & Southern Lake Michigan	15	$5,260	$5,019	$2,764
Within Southern Lake Michigan	6	$3,156	$3,011	$2,073
Movage	12	$1,262	$1,205	$691
Area 7				
Gros Cap & DeTour	10	$2,104	$4,015	$2,583
Sault Ste. Marie, MI & DeTour and any point in between	13	$2,735	$5,220	$2,165
Sault Ste. Marie, MI & Gros Cap	13	$2,735	$5,220	$973
Movage	4	$842	$1,606	$973
Area 8				
Gros Cap & Thunder Bay	18	$3,787	$2,313	$1,758
Gros Cap & Duluth or Superior	31	$6,522	$3,983	$2,930
Duluth or Superior & Thunder Bay	22	$4,628	$3,533	$2,344
Movage	4	$842	$1,606	$1,114

The calculation steps taken to create this table serve as an example of the process that would be used to establish a new baseline set of tariffs in the ratemaking process. These tariffs would link the pilotage time needed to provide the service and the billing rate for the service. The rate multiplier would be applied to these new tariffs to arrive at the adjusted tariff for the projected year.

To ensure continued alignment, it is recommended that the process for generating the tariffs be revisited annually. The review may be scheduled to occur at specific time intervals (e.g., every few years) or because of specific system adjustments (e.g., new regulation for travel speed or fuel consumption standards that affect speed). The distribution of traffic can change and the tariffs should be adjusted based on current traffic distributions.

It is recognized that adjusting the billing structure will require retraining of staff to generate and process billing statements. The recommended point-to-point structure with a single fee for a transit and the elimination of additional calculations for mileage, dockage, or lock transits will simplify the process.

Cooperation with the Canadian GLPA will be necessary in order to make any modifications and retain alignment between the U.S. and Canadian billing schemes.

2.5 Target Rate of Return on Investments

The target rate of return is currently being used as a benchmark to ensure the ROI of the association investment base is reasonable. The goal of the target rate of return is to "determine a market equivalent ROI that will be allowed for the recognized net capital invested in each association by its members." Pilotage rates are set to allow for this ROI to be realized on the approved investment base. This ROI, along with allowable operating expenses and pilot compensation, is verified in Step 6 of the methodology.

The target ROI for the 2013 FR is the average rate of return for Moody's Seasoned Aaa Corporate Bond Yield found at http://research.stlouisfed.org/fred2/series/AAA/downloaddata?cid=119. Comments have been expressed that this rate is too low and that a less-conservative rating should be used.

Associations are permitted to include interest on investments as an expense, so the ROI is in addition to interest expenses and investments. With a conservative benchmark (as used with most public investment programs), a return is always guaranteed.

This limited return solely on the improved investment base does not promote investment in infrastructure and training for the pilots. A revenue gap experienced over the past several years has made it difficult for associations to acquire sufficient capital for larger infrastructure investments. The approach described in **Section 3.5.2: Business Risk** addresses these factors to encourage investment in infrastructure and training.

Considerations for developing an alternative benchmark for ROI are:

- Is commonly accepted
- Is readily available
- Is consistently updated on a regular basis
- Is applicable to the association investment type (low risk, medium liquidity, and not adjusted for inflation)
- Promotes investments in infrastructure and training

Recommendation:

- Continue using the Moody's Seasoned Aaa Corporate Bond indicator. Although another index could be used, such as U.S. Treasury securities, federal agency securities, and corporate notes rated "A" or higher and having a maturity level of five years or less, Moody's indicator provides a sufficient balance between risk and a reasonable guaranteed rate of ROI by the associations. It is readily available and consistently updated. It applies to medium-term liquidity investments. A comparison to other benchmarks for public investments is provided in **Table 25: Comparison of Public Investment Indices**.

Table 25: Comparison of Public Investment Indices

Year	Moody's Seasoned Aaa Corporate Bond Yield (AAA)	Barclays US 1–5 Year Gov Float Adjusted Index	BofA Merrill Lynch Wrapped 1–5 Year Corporate/Government Index
2010	4.94%	4.08%	3.20%
2011	4.64%	3.23%	2.90%
2012	3.67%	2.24%	2.43%

- The calculation for ROI should be simplified to multiplying the investment base by the current Moody's Seasoned Aaa Corporate Bond indicator and that amount included when projecting revenue required along with expenses and pilot compensation. The current

methodology in Step 6.1 infers that the calculation is managing a reasonable operating profit for the association. This ambiguity should be removed.

- Remove Step 6.2 in the methodology since an adjustment will always be made.

2.6 Pilot Compensation

Pilot compensation is approximately 70% to 80% of the total expenses of the associations and comprises wages and benefits. Wages include pay to the employee and payroll taxes paid by the employee. Benefits are costs paid by the employer on the employee's behalf and include employer portions of taxes, pension or retirement plans, and insurances (e.g., medical, dental, life, disability). While some benchmarks are expressed in terms of total compensation without distinguishing between wages and benefits, other are presented in terms of just wages and an estimate for benefits is determined.

Issues that have been expressed with the current methodology for estimating pilot compensation include:

- Uncertainty of pilot pay and its impact on being able recruit and retain well-qualified individuals.
- The inability of pilots to attain the target compensation over the past several years.
- Inadequate level of compensation.
- The calculation to estimate pilot compensation with multiple union contracts is lengthy and impacts the clarity of the process.
- The AMO union contracts are not a matter of public record; information from the contracts is limited in distribution and is not required to be provided by AMO. This makes it difficult to obtain accurate union compensation rates in a timely manner.
- There are questions regarding the applicability of AMO union contracts' first mate's compensation as the basis for pilot wages in undesignated waters and 150% of that amount for wages in designated waters.
- Whether there should be a differentiator between undesignated and designated waters, because the pilots are certified for both undesignated and designated waters and many operate in both interchangeably.
- There are concerns over the calculation methodology, where wages are calculated as being different for undesignated water pilots and designated water pilots but benefits are calculated at the same value. The benefit values are the same amount for the health and pension portions and the same percentage of monthly wages for the employer contribution to 401(k) plan portion. Because total wages are higher, the percentage contribution to the 401(k) is larger for designated waters, causing total benefits to be slightly different.
- The AMO union contracts are negotiated and implemented under their own time frame. These times do not always coincide with the Great Lakes pilotage ratemaking process, which results in Great Lakes pilotage rates changing halfway through a pilotage season.

To address these factors, a benchmark or process to determine pilot compensation level should be established that is:

- Readily available and visible;
- Reflective of maritime pilot responsibilities;
- Stable; and
- Provides a check and balance from those who have the greatest interest in increasing compensation and prevents continuous increases based on average comparisons with other selective pilot organizations.

An attempt to identify comparison of the Great Lakes pilotage environment to other pilotage operations in the United States was undertaken as part of this report using publicly available data. The primary sources are the 2012 *Review and Analysis of Harbor Pilot Net Incomes* by B. Dibner and the U.S. import/export trade statistics published by the U.S. Department of Commerce. The Dibner report identified the operational characteristics (type of cargo, number of pilots, number of vessels, and pilot net salary) of the pilotage organizations primarily serving the U.S. Gulf of Mexico and Pacific Coast. The import/export statistics compared the value and size of the international cargo moving by vessel through the U.S. port areas. A summary of these key references is presented in **Appendix D.** No correlation was found between any of the operating characteristics and the reported average compensation for pilots with each association. This is intuitive, considering the pilot industry itself is based on providing unique skills and knowledge of a specific region. For the Great Lakes, these differences include:

- Seasonality of operations
- Larger geographic scope of operations
- Smaller size of vessels served
- Smaller value per unit of cargo
- Extended transit distances

The development of alternatives to estimate pilot compensation takes into consideration factors discussed in the following sections: undesignated/designated waters differentiator, an escalation factor, and compensation benchmark alternatives. A single recommendation to discontinue differentiating between undesignated and designated waters and a single recommendation to apply an escalation factor will be considered with four alternative compensation benchmarks. This will avoid presenting all the possible combinations of these factors.

Undesignated/Designated Waters Differentiator

The current ratemaking process establishes two separate compensation estimates: one for undesignated water pilots and the other for designated water pilots. Pilots in Districts 2 and 3 are certified and operate in both undesignated and designated waters. This cross-coverage results in no differentiation within these Districts. In District 1 the undesignated pilots are also certified to operate in designated waters, but the revenues and compensation for undesignated waters are differentiated from the designated waters.

The recommendation is to simplify the calculations and establish a single annualized estimated pilot compensation rate. All the base pilot compensation alternatives listed below will include the removal of the differentiator of undesignated/designated waters. The associations may establish different compensation strategies within their associations based upon their association rules. Establishing a single estimated compensation recognizes pilots for their capability to cross-cover during times of high demand and supports the approach to considering pilot capacity equivalent across both undesignated and designated waters.

Escalation Value

An escalation value is required in cases where the compensation value does not have a published annual adjustment and an update for the ratemaking year is not available. There are two options to consider for the escalation value: the Consumer Price Index (CPI) and the ECI. Both of these indexes are major economic indicators published by the BLS.

The CPI measures the average change in the prices paid for a market basket of goods and services. These items are purchased for consumption by the two groups covered by the index: All Urban Consumers (CPI-U) and Urban Wage Earners and Clerical Workers (CPI-W). The CPI-U is the index most often reported by the national media. The CPI-W is the index most often used for wage-escalation agreements. The most frequently used escalation applications are in private sector collective bargaining agreements, rental contracts, insurance policies with automatic inflation protection, and alimony and child support payments.

The ECI[15] is well suited as a vehicle to adjust wage rates to keep pace with what is paid by other employers for two reasons. First, it is comprehensive. It includes both wages and employer costs for employee benefits, and covers nearly all employees in the non-federal civilian economy. Second, it measures the "pure" change in labor costs; that is, it is not affected by changes in relative employment of industries and occupations with different wage and compensation levels. A 12-month moving average is completed every three months.

The ECI includes three series:

- A **compensation** series that includes changes in the combination of wages and employer costs for employee benefits;
- A **wage** series; and
- A **benefit costs** series.

Both the CPI and ECI are retrospective series, measuring changes that have occurred, and are available on a quarterly basis. It is recommended that the escalation value be based on the changes that occurred in the previous 12 months. For example, for 2013 ratemaking, 2012 compensation estimates would be escalated by the most recently available 2012 ECI.

Both the CPI and ECI are reliable and accessible values to estimate year-to-year adjustments in pilot compensation. Compensation alternatives listed below requiring an escalation value to create an annualized estimated pilot compensation for the coming year will use the appropriate series ECI as the escalation value.

[15] The recommended ECI is not seasonally adjusted for civilian workers and not based on a specific occupational group (e.g., using the "All Workers" statistics).

Compensation Benchmark Alternatives

A benchmark for pilot compensation is necessary to remove ambiguity and provide stability. The following alternatives for establishing a benchmark or process for estimating pilot compensation were considered:

- AMO union contracts rates
- Canadian Great Lakes Pilotage Authority average compensation
- Federal pilot wages and U.S. Bureau of Labor Statistics (BLS) averages for benefits
- Negotiated Pilot Compensation between pilots and industry

Alternative 1: AMO Union Contract Values

Significant concerns about the availability of information and the use of the AMO union contracts to estimate pilot compensation were highlighted with the 2013 ratemaking NPRM and Final Ruling (FR). The 2013 NPRM, published in August 2012, provided an estimate for undesignated/designated waters pilot compensation of $212,094/$293,302 (Table 13 of the 2013 NPRM). An update to that estimate in February 2013 based on letters received by the Coast Guard from the unions resulted in estimated compensation of $158,694/$217,906 (Table 13 of the 2013 FR). This is a significant swing in the reported compensation rate and highlights the concern of lack of visibility in comparable pilot compensation and methods for estimating compensation for union employees.

The AMO is not required to share union information with the Coast Guard. AMO information may be widely available, but the ability to release that information in a public forum is restricted. If permission to release this information is not obtained from AMO, it will dramatically impact the transparency of the ratemaking process.

Alternative 2: Canadian Great Lakes Pilotage Authority Compensation

The Canadian Great Lakes pilots are the most comparable pilot organization. They work the same waterways on the same types of vessels and cargo. The Canadian Great Lakes pilots are organized under a collective agreement between the Great Lakes Pilotage Authority and the Corporation of Great Lakes Pilots and the Canadian Merchant Service Guild. This agreement is a matter of public record and covers the Great Lakes region with the exception of the St. Lawrence Seaway. The agreement specifies that salary is made up of:

- A monthly salary;
- Payment for the rest days not taken; and
- End-of-year productivity bonus.

A scaling factor for overtime (when the pilots exceed a specified number of assignments during the season) is also applied.

Benefits are a combination of life insurance, health insurance, dental insurance, disability insurance, and pension, but the financial contribution is not specifically defined in the collective agreement.

As part of their reporting requirements, the Canadian GLPA produces an Annual Report Plan. In the 2011 Annual Report they report 56.5 pilots in 2011 and Pilot Salaries and Benefits as C$13,196,544. This translates into C$233,567 per pilot (or US$238,238 with a 1.02 Canadian to U.S. conversion factor). This figure is total compensation.[16]

As a comparison, average compensation for the Canadian LPA is provided from their Annual Report and Corporate Plan. In 2011 that rate was C$311,246 per pilot (or US$317,470 with a 1.02 Canadian to U.S. conversion factor). Comparing the GLPA 280-day season to the 365-day LPA season makes these two compensation levels comparable.

Alternative 3: Federal Pilot Compensation

The Civilian Personnel Management Service (CPMS) for the Department of the Navy establishes on a regular basis a benchmark of pay for Ship Pilots. This benchmark is established by CPMS based on extensive surveys and analysis of wages throughout the country. The published rate is based on a year's worth of effort by the pilot.

The last published pay figure was in 201117 at an annual wage rate of $176,445. This rate was implemented in January 2011and is scheduled to be revisited on a three-year cycle. The figure published by CPMS is for wages only. Benefits are not included in the estimate.

The recommended estimates for benefits are derived from a percentage of overall compensation and published on a regular basis by the BLS.18 For the period ending in December 2012, the benefit rate for small private companies with fewer than 49 employees was 25.2% of total compensation (or, equivalently, 33.7% of wages). Benefits consist of retirement income, paid leave, health insurance, and legal mandates. Great Lakes pilot associations are considered private organizations.

In years where CPMS does not establish a new rate, the wage and benefit values will be escalated with the appropriate ECI series. When a new wage rate is published, the benefits rate will be determined from the ECI benefits costs series to determine total compensation.

Alternative 4: Negotiated Pilot Compensation between Pilots and Industry

Similar to the way in which compensation levels are negotiated within the Canadian GLPA, the pilots and industry would negotiate a reasonable level of compensation (wages and benefits) with annual escalation for the duration of the agreement to propose to the Coast Guard as an input to the ratemaking process. This approach increases the transparency of the process.

A comparison of the alternatives is presented in **Table 26: Comparison of Alternative Compensation Benchmarks.** A weighted average for the AMO union contracts was calculated based on a total of 22 pilots in undesignated waters and 16 pilots in designated waters. For the Canadian GLPA, total compensation figures are available publicly in the annual report.

[16] Although "Employee future benefits" are listed as separate line items on the "Statement of Financial Position," Note 13 clarifies that this is "included in the Statement of Operations and Comprehensive under salaries and benefits."

[17] www.public.navy.mil/donhr/compensation/paysystems/Pages/ShipPilots.aspx. An updated rate is anticipated to be provided in the spring of 2013.

[18] "Employer Costs for Employee Compensation," Table 14; ftp://ftp.bls.gov/pub/special.requests/ocwc/ect/ececqrtn.txt.

Benchmark wages for the federal pilot are publicly available. Estimation of benefits is based on BLS data, estimating benefits at 25.2% of total compensation (33.7% of wages) for the private sector small companies.

Table 26: Comparison of Alternative Compensation Benchmarks

	Alt 1 2013 AMO Weighted Average	Alt 2 2013 Canadian GLPA	Alt 3 2013 Federal Pilot	Alt 4 Negotiated Between Pilots and Industry
Wages			$183,573[19]	Specific values to be Negotiated & Proposed
Benefits			$60,579	
Compensation	$183,685	$247,862[20]	$244,153	

An assessment of alternative benchmarks for pilot compensation is summarized in **Table 27: Assessment of Pilot Compensation Alternatives.** The recommendation is to use as a benchmark a compensation level negotiated by the pilots and industry and proposed to the Coast Guard as an input to the ratemaking process.

Table 27: Assessment of Pilot Compensation Alternatives

	Alt 1	Alt 2	Alt 3	Alt 4	Risk Statement
Safety	0	1	1	1	**Risk to Safety**
					Perception of low compensation leads to morale and retention issues.
Efficiency/Reliability					**Risk to Efficiency/Reliability**
					N/A
Cost	3	1	5	11	**Risk to Cost**
					Pilot compensation is approx. 70% of expenses, causing a direct correlation between compensation and rates.
Ratemaking Process	-13	5	6	3	**Risk to the Ratemaking Process**
					Reliance on year-to-year variances based on other external factors (union contracts) and lack of visibility into proprietary information causes concern/anxiety. Current calculations reduce clarity.
Overall Assessment	-10	7	12	15	

[19] Based on 2011 published wage adjusted for adjusted for 1.9% ECI for 2011 and 2.0% ECI for 2012.

[20] 2011 GLPA average adjusted for 1.9% ECI for 2011 and 2.0% ECI for 2012. For comparison purposes, medical expenses under the Canadian system are balanced against the increased tax rate.

Recommendation:

- Alternative 4 be pursued, and pilots negotiate reasonable pilot compensation in consultation with industry to propose to the Coast Guard as part of the ratemaking process.
- A single estimation for both undesignated and designated waters be used in the ratemaking calculations. This simplifies the ratemaking process, recognizes the pilots for equivalent certification, and equates all pilot capacity.
- Replace the term "target compensation" with "estimated compensation." The role of the Director and the purpose of the ratemaking process are to provide recommendations on modifications to pilotage rates. In order to do so, pilot compensation must be estimated. The amount or compensation a pilot is "targeted" to receive is based on many factors outside the ratemaking process, including the actual traffic demand and pilot association working rules regarding compensation.

In order to provide an example comparison of the impact on compensation within each District, the values for the federal pilot wages and the 25% of total compensation (33% of wages) are provided in **Table 28: Example Impact on 2013 Pilot Compensation.** A weighted average for pilot compensation from the FR is used to compare to the single value for estimated Federal Pilot Compensation. The escalation for the 2011 estimated federal pilot wage was tied to the ECI change for 2011 (1.9%) and 2012 (2.0%) to arrive at a 2013 estimate.

Table 28: Example Impact on 2013 Pilot Compensation

	Number of Pilots – 2013 FR		Rate of Pilot Compensation –2013 FR			2013 Example Federal Pilot Compensation
	Undesignated Water	Designated Water	Undesignated Water	Designated Water	Weighted Average	
District 1	5	6	$158,694	$217,906	$190,991	$244,153
District 2	4	6	$158,694	$217,906	$194,221	$244,153
District 3	13	4	$158,694	$217,906	$172,626	$244,153

Within the current ratemaking process, the estimated pilot compensation is multiplied by the number of area pilots to arrive at an area-specific total pilot compensation value. Changes to the estimation of annualized pilot compensation cannot be made independently and must consider changes to the number of pilots.

3 SYSTEM ISSUES

MSI was tasked to assess the overall ratemaking system. These additional recommendations are broader in scope and, in some cases, step back from the mechanics of the ratemaking process to look at how effectively the objectives of the process governing the safe, reliable, and efficient delivery of pilotage services are being achieved.

Five problem areas were identified and each observation categorized by these problem areas. A summary is provided in **Table 29: Summary of Problem Area Observations:**

- **Hidden Risks** – Current practices have evolved in response to providing reliable and efficient pilotage services. Although these practices have not resulted in an incident, they have created risks that can either be avoided or reduced.
- **Revenue Gap** – Revenue generated has not reached the estimated revenue required in the ratemaking process. This revenue gap has resulted in high levels of anxiety regarding stable pilot compensation aligned with estimates made in the ratemaking process.
- **Ratemaking Benchmarks** – Increase objectivity in the ratemaking process through the application of visible benchmarks.
- **Sustaining Pilot Proficiency** – Formal and structured training, recruitment, and retention programs are not visible in the ratemaking process.
- **Ratemaking Management/Governance** –Both the methodology and the processes for providing input to the ratemaking process are complicated and resource intensive and often obfuscate stakeholder issues.

Table 29: Summary of Problem Area Observations

		Address Hidden Risks	Close the Revenue Gap	Establish Ratemaking Benchmarks	Sustain Pilot Proficiency	Improve System Management
Required Areas of Analysis						
Ratemaking Terminology (Section 2.1)		✓				
Seasonal Work Standard for Pilots (Section 2.2)		✓				
Staffing Levels (Section 2.3)						
3-year Hybrid Historical Average (Section 2.3.1)			✓			
Estimate Based on Average and Standard (Section 2.3.2)		✓				
Billing Scheme (Section 2.4)			✓			
Target Rate of Return on Investment (Section 2.5)				✓		
Benchmark for Estimating Pilot Compensation (Section 2.6)				✓		
Additional Ratemaking Related Issues						
The Projected Revenue Calculation (Section 3.2.2)			✓			
Baselined Tariffs (Section 3.2.4)			✓			
Rate Multiplier Calculations (Section 3.5.1)						✓
Time Value of Expenses (Section 3.2.3)			✓			
Business Risk (Section 3.5.2)						✓
Ratemaking Governance and Review Process (Section 3.5.3)						✓
Supplemental Issues						
Long Assignments in Area 6 (Section 3.1.2)		✓				
Risk Assessment (Section 3.1.4)		✓				
Structure Training Programs (Section 3.4.1)					✓	
Recruitment and Retention (Section 3.4.2)					✓	
Shared Services (Section 3.5.4)						✓
Klein System Information (Section 3.5.5)						✓
Association Working Rules (Section 3.1.1)		✓				

3.1 Hidden Risks

Federal regulations provide a means to manage and mitigate risk. The performance of the Great Lakes pilotage system is exemplary when measuring the number of incidents or the delay to shipping caused by pilot capacity and availability. These measures are not sufficient to provide visibility of potential consequences – risks within the system that did not result in an incident. Current practices and arrangements between pilot associations and industry are not fully captured in the federal regulations, measures, or data. Although these practices have not resulted in an incident, they have created risks that can either be avoided or reduced.

3.1.1 Association Working Rules

The working rules for each association reflect how they plan to meet the requirements of the regulations and achieving the goals of providing safe, efficient, and cost-effective pilotage services.

During the course of discussions with pilots within each of the Districts, it was found that they have adapted their working rules to better fit the current operations on the Great Lakes and provide efficient pilotage services. The conflict between the currently approved working rules (summarized in **Table 1: U.S. Great Lakes Pilotage System Overview**) and the working practices of the pilot associations leads to ambiguity in the assumptions and analysis.

Recommendation:

It is understood that the process for updating each association's working rules may already be underway. In that process, consideration should be given to including the following inclusions in the work rules:

- Increase consistency across the associations.
  - Consistency with the number of scheduled days off each month and which month scheduled time off occurs.
  - Consistency regarding rest periods as well as mandatory rest associated with cancellations and movages.
- Document the work rules for any agreements that have been reached either implicitly or explicitly with industry. For example, the retention of the pilot through the St. Marys River.
- Clarify the rules for implementing double pilotage.
- Clarify the rules for mandatory rest with movages and cancellations.
- Document the rules associated with the pilot change point at Iroquois Lock. It is not recommended that the change be mandatory. A mandatory change would consume significant pilot capacity associated with additional travel and mandatory rest.

3.1.2 Long Assignments in Area 6

As seen from **Table 21: Example Standard Hourly Transit and Six-Hour Blocks,** there are some very lengthy transits in Area 6 – some well in excess of 20 hours. Although these transits are in undesignated waters, harbor/river navigation is still required as well as navigation in the lakes at critical and call-in points. Rest periods during these long transits are sporadic and brief,

may not align with the pilot's sleep cycle, and can lead to short-term fatigue. There is risk in having a single pilot provide services for such a lengthy time and performing risky maneuvers in port or on the river at the end of the transit. Establishing regular and prolonged sleep cycles will increase safety and reduce the risk of fatigue on these long journeys. Two alternatives are presented to mitigate this risk of long assignments in Area 6:

- **Alternative 1:** Establish an additional pilot change point. The pilot change location should be in an area where the vessel is not in heavy traffic, can slow, and can maintain a steady course for approximately 15 minutes. Alee from weather is preferable.
- **Alternative 2:** Mandate two pilots on long legs – establishing a watch rotation between the pilots.

Example calculations for these alternatives will be presented based on 2011 Klein system information and identified assumptions. Only average transit times in excess of 20 hours without the long rest period in Lake Michigan are considered. Those transits are extracted from **Table 21: Example Standard Hourly Transit and Six-Hour Blocks** and summarized in **Table 30: Example Pilot Change Demand**.

Table 30: Example Pilot Change Demand

Transit Definition	2011 Occurrences	Average Transit (hrs)	Two-Pilot Demand (hrs)
B12 & Milwaukee	19	36.4	692
B12 & Green Bay, Menominee, or Sturgeon Bay	46	32.6	1,500
B12 & Little Current, ON	2	25.6	52
DeTour, Cheboygan, or Mackinac & Milwaukee	12	21.1	254
DeTour, Cheboygan, or Mackinac & Green Bay, Menominee, or Sturgeon Bay	5	24.1	121
DeTour, Cheboygan, or Mackinac & Little Current, ON	1	29.6	30
Goderich, ON & Green Bay, Menominee, or Sturgeon Bay	1	34.3	35
Milwaukee & Green Bay, Menominee, or Sturgeon Bay	3	23.7	72
	89		2,756

A full cost-benefits analysis is recommended. A comparison of costs is provided in **Table 31: Pilot Change Point/Additional Pilot Cost Comparison.** A conservative estimate for pilot boat operations was derived from reported expenses for District 2. Actual pilot boat costs would be higher. Multiple pilot change points would require multiple pilot boats (e.g., Mackinac Straits, Green Bay, Georgian Bay). This estimate does not include the cost of acquiring the pilot boat and includes a conservative estimate for the operating expenses for the pilot boat. A pilot boat capable of operating in heavy ice and a mooring location will also be necessary and will significantly increase the costs. The cost of providing an additional pilot is significantly less than establishing a pilot change point.

Table 31: Pilot Change Point/Additional Pilot Cost Comparison

	Alternative 1 Pilot Change Point	Alternative 2 Additional Pilot
2nd Pilot Travel to Location (hrs)	7	
1st Pilot Travel Back from Location (hrs)	7	
2nd Pilot Average Time on Assignment (less Trip Time) (**Table 11**) (hrs)		3.1
Additional Administrative Time (hrs)	0.5	
2nd Pilot Mandatory Rest (hrs)	13	13
Pilot Capacity for 71 Occurrences (hrs)	2,448	1,433Table 30
2nd Pilot Transit Time for Season (**Table 30**) (hrs)		2,756
Total Pilot Capacity (hrs)	2,448	4,189
Additional Pilots (capacity 2,556 hours per pilot – **Table 11**)	0.99	1.69
Pilot Capacity Cost ($158,694 from 2013 FR)	$156,336	$267,569
Pilot Boat Operations	$220,000	
Estimated Annual Cost	**$376,336**	**$267,569**

Recommendation:

It is recommended that a full alternatives and cost-benefit analysis be conducted for Area 6. Adjusting the conservative estimate provided above for the cost of operating and acquiring the pilot boat, the two alternatives are comparable. In order to reduce the existing risks associated with the long transits in Area 6, two-pilot assignments could be implemented in the interim. The full cost-benefit analysis should take into account:

- The full costs of maintaining the pilot boat;
- The acquisition cost for the pilot boat and facility; or
- The lease costs for the pilot boat.

3.1.3 Pilot Change at Iroquois Lock

In Area 1 there has been concern over restrictions to be able to change pilots at Iroquois Lock for safety reasons. Current work rules are limited to changing the pilot out at night or for long transits.

For Area 1, modification to the work rules to allow more liberal pilot change at Iroquois Lock can address that matter simply. It is not recommended that the change be mandatory. A mandatory change would consume significant pilot capacity associated with additional travel and mandatory rest during periods where a pilot change may not be warranted (e.g., daytime transit from Snell Lock to Cape Vincent where the latter half of the trip does not require any lockage).

The seasonal work standards presented in **Table 7: Example Average Pilot Assignment Cycle for Each Area** reflect statistics from the Klein system where a change out at Iroquois Lock occurs approximately 50% of the time. Should the practice become more prevalent, the average Trip Time for Area 1 will decrease, causing the expected number of assignments to increase.

Recommendation:

- Adjust District 1 work rules to provide, when safety dictates, the pilots in Area 1 the latitude to change pilots at times other than at night or for long transits. Changes to any work rules regarding pilot change-out at Iroquois Lock may require coordination with the Saint Lawrence Seaway Management Corporation, which has jurisdiction over Iroquois Lock.
- As is the case currently, the total charge of the transit from Snell Lock to Cape Vincent should remain constant regardless of whether a single pilot is changed out at Iroquois Lock.

3.1.4 Risk Assessment

In discussions with stakeholders, it was found there are risks associated with the delivery of safe and efficient pilotage service that are not visible in the ratemaking process or typical performance measures (e.g., delay, groundings, collisions). These risks are being masked by the decisions of pilots to respond to the needs of industry.

Key risks identified include:

- Fatigue and micro-sleep placing navigation of the vessel at risk.
- Extended overland travel – especially after long assignments – and dangerous driving conditions placing the safety of the pilot at risk.
- Abbreviated resting periods to avoid delays increasing the probability of fatigue related incidents.
- Cancellations with the possibility of increased cost to the industry or consumption of pilot capacity without services rendered.

A careful review of the data for 2011 in the Klein system uncovered a possible hidden risk in the system, with pilots completing back-to-back assignments with insufficient mandatory rest in between assignments. A review of 2011 Klein system data showed that 38 of 730 voyages in the Klein system data (a "voyage" is sequential job records in the Klein system) were back-to-back assignments completed by the same pilot without the mandatory rest period (e.g., the same pilot continuing past a pilot change point or getting underway with a vessel a short time after completing an assignment with the same vessel).

Recommendation:

It is recommended that a full risk analysis be conducted and a baseline established. A comprehensive listing of threats and vulnerabilities can be identified along with their frequency and consequence. The comprehensive risk assessment will provide a baseline for the application of risk mitigation strategies. These strategies will lead to modifications in work rules for pilots and industry and establish performance measures to make visible these risks. Any increase in costs as a result of modified work rules can be attributed to specific risk-reduction measures. The risk assessment should be revisited on a regular basis to measure the effectiveness of those mitigation strategies.

3.2 Revenue Gap

Predominant throughout every conversation with pilot stakeholders has been a repeated pattern of not generating the revenues estimated in the ratemaking process. Revenue requirements within the process are determined based on estimated operating expenses, pilot compensation, and a return on investment (additional adjustments to expenses also are permitted). The inability to generate revenue to cover this collection of costs has resulted in uncertain levels of pilot compensation – the greatest contributing factor to the angst among pilot stakeholders and the difficulty in attracting and sustaining a highly qualified pilot pool.

3.2.1 Use a Hybrid Historical Average to Project Demand

Errors in projection of demand have been the leading contributor to the revenue gap experienced over the past several years. As discussion in **Section 2.3.1: Applying an Average to Project Demand,** the most recent historical data provides the best indicator of projected demand. However, in order to offset the lag resulting from applying a historical average, a single year's projection for the upcoming season can be added to the average. This projection should be:

- Expressed in terms of growth/decline of the previous season;
- Be relatively small; and
- Reflect the perceived economic conditions for the upcoming year.

3.2.2 The Projected Revenue Calculation

When projecting revenue for each of the areas (Step 3 of the Appendix A methodology), the projected bridge hours for that year are multiplied by the average hourly pilotage rate from the previous year. The average hourly pilotage rate for the previous year is calculated by taking the average hourly pilotage rate from the previous year and multiplying it by the rate multiplication factor for the previous year. For example, in order to estimate the projected revenue in each area for 2013, the projected bridge hours for 2013 are multiplied by the average hourly pilotage rate from 2012. The average hourly pilotage rate for 2012 is calculated by taking the average hourly pilotage rate from 2011 and multiplying it by the rate multiplication factor from 2011.

Concerns expressed on this process center on the use of a calculated value each year that has not been baselined to actual performance.

With the recommended transition to assignments instead of hours, the same calculation is performed, but with the "per assignment" units. Each year, the number of assignments is recorded in the Klein system. The revenue generated for that year is divided by the total number of assignments to determine the average revenue generated per assignment.

Projected demand is also recommended to be expressed as the number of assignments, so calculation of projected revenue is completed by multiplying the projected number of assignments by the previous year's average revenue per assignment.

Recommendation:

Along with previous recommendations to convert from hours to assignments in calculations, the most recent set of data available on the revenue generated and number of assignments should be used to calculate the projected revenue in Step 3 and Step 3.a of the Appendix A methodology.

A comparison of the estimated value to the actual value is provided in **Table 32: Comparison of 2011 Average Hourly Revenue.** The perpetuation of a calculated value for the average revenue per hour has, in some cases, been far removed from the actual revenue generated per hour.

Similarly, when converting to assignments, the most recent set of data should be gathered to re-baseline the average revenue generated per assignment.

Table 32: Comparison of 2011 Average Hourly Revenue

		2011 FR Estimates (Hours)			2011 Actual (Hours)			2011
		2011 FR Average Revenue per Hour	2011 FR Projected Demand (hrs)	2011 FR Projected Revenue	2011 Actual Average Revenue per Hour	2011 Actual Bridge Hours	2011 Reported Revenues (Estimated by Area)	Revenue Gap
D1	Area 1	$451.38	5,203	$2,348,530	$417.73	4,743	$1,981,302	($367,228)
	Area 2	$298.99	5,650	$1,689,294	$287.85	5,072	$1,459,963	($229,331)
D2	Area 4	$196.19	7,320	$1,436,111	$325.39	3,498	$1,138,214	($297,897)
	Area 5	$519.86	5,097	$2,649,726	$505.27	3,379	$1,707,321	($942,405)
D3	Area 6	$199.12	11,606	$2,310,987	$191.02	10,796	$2,062,238	($248,749)
	Area 7	$495.52	3,259	$1,614,900	$484.33	1,577	$763,791	($851,109)
	Area 8	$193.71	9,830	$1,904,169	$265.42	3,741	$992,928	($911,241)
	Totals		**47,965**	**$13,953,717**		**32,806**	**$10,105,757**	**($3,847,960)**

3.2.3 Time-Value of Expenses

In Step 3.c of the current ratemaking process, an inflation factor is applied to recognized expenses. This inflation factor only accounts for a single year of inflation with expenses. However, audit information received on expenses is typically lagging for two years or more. In the ratemaking process published for 2013 rates, audited expense information from 2010 was used in Step 1.b. Only the CPI for 2011 was applied to those expenses. This would bring 2010 expenses up to a 2011 estimate. The most recent quarterly CPI would also need to be applied to adjust expenses to a 2012 level, and then a projection of 2013 CPI should be applied. This would result in the application of inflationary factors to bring the 2010 audited expenses to an estimate 2013 level.

Recommendation:

Apply the CPI-U for the overall Midwest Region of the United States (found at www.bls.gov/ro5/cpi-mid.htm) for each "succeeding navigation season" from the year the audits were taken to the most recent CPI available – not just the "preceding year's" (46 CFR Part 404, Appendix A, Step 1.c). For 2012, the December–December CPI-U annual percent change (not seasonally adjusted) was 1.8%.

3.2.4 Baselined Tariffs

The history of the existing distribution of tariffs published is uncertain and beyond the scope of this research. The existing process of applying a rate multiplier to the existing tariffs is another example of estimates being applied to previous estimates, and any errors are perpetuated in the current methodology. This approach also does not compensate for adjustments in traffic type or location. Recently the GLPAC approved an adjustment to the weight factors for vessels that is multiplied by the rate on the tariff card to determine the charge to the ship. Simply applying a rate multiplier to existing rates will not compensate for the impact of this modification to the weight multiplier.

On a regular basis, the listing of tariffs should be revisited to ensure it is reflective of the current traffic distribution and movements. Incorporating the revenue required in this process addresses the revenue gap by baselining tariffs so that they generate the revenue required (provided demand is as expected).[21]

An example method of baselining tariffs is carried out in a similar manner in which the example billing schemes were produced in **Section 2.4: Billing Schemes.** This procedure calculates a tariff charge based on the distribution of ship weighting factors and projected occurrences of each type of charge:

1. The number of occurrences of each type of charge is determined for each area for each vessel type (weight factor) from the most recently available complete data set.
2. The average time to provide each type of charge is determined from the most recently available complete data set.
3. A weighting factor for undesignated waters is determined if necessary. This factor is less than 1.0.
4. The revenue required is determined for the upcoming ratemaking year.
5. Using only those tariffs incorporated within the projected demand (i.e., not including items such as movages, detentions, delays, and cancellations), determine the total number of weighted hours for an area. The weighted hours are determined by summing the multiplication of the number of occurrences by the ship weighting factor across the area (found in Step 1). If a weighting factor for undesignated waters is also being applied (Step 3), each of these occurrences is multiplied by that factor for undesignated waters.

[21] MSI performed an analysis to determine whether sufficient revenue is generated if the projected demand is achieved. Using the actual demand of 2011 as the projected demand in 2013 along with using actual 2011 revenue and traffic to calculate actual revenue generated per hour, the 2013 Appendix A ratemaking methodology recalculated rate multipliers and applied those to the 2012 tariffs. The actual trips recorded in Klein for 2011 were then priced out based on this revised set of tariffs, and the required revenue was achieved.

6. Divide the total revenue required (Step 6) by the total number of weighted hours (Step 5) to determine an average allowance for a weighted hour of pilot capacity.
7. For each type of charge, multiply the average time (Step 2) by the average allowance for a weighted hour; multiply by the weighting factor for undesignated waters.

The above procedure results in a list of tariffs based on a historical distribution of traffic and ship type. Each tariff is set at a rate such that if the same distribution of traffic is experienced, the revenue generated will be equal to the revenue requirement (with additional revenue not included in demand projections).

Recommendation:

On a regular basis, baseline the rates for each identified entry on the tariff listing. The baseline procedure is based on the revenue required for the ratemaking year and the most recently available experienced traffic distribution.

The concept of a "rate multiplier" is now applied in a more straightforward manner by multiplying the rates on the baselined tariff listing by the ratio of actual demand for the data set used in the baselining procedure to the projected demand for the ratemaking year. This compensates for the difference in demand for the upcoming year and the actual demand of the data set used. The use of previous years' estimates on average revenue per hour is replaced by the baselining procedure.

3.3 Ratemaking Benchmarks

Several of the inputs to the ratemaking methodology are highly sensitive, with minor variations causing large changes in the final rate. These inputs are subjective and have led to accusations and concerns on the validity of the ratemaking process. Variations in these sensitive inputs also result in rate fluctuations, decreasing industry's ability to budget.

Establishing benchmarks increases the objectivity and reduces the volatility of these parameters.

3.3.1 Rate of Return on Investment

The ROI rate discussed in **Section 2.5: Target Rate of Return on Investments** provides sufficient guaranteed ROI for the pilot associations and is comparable to other public investment benchmarks for risk and liquidity.

3.3.2 Pilot Compensation

Establishing a benchmark for pilot compensation was discussed in **Section 2.6: Pilot Compensation.** Identifying a benchmark provides stability and visibility into pilot compensation. Taking into account projected conditions, pilots and industry should negotiate a reasonable level of compensation and the impact on the rate.

3.3.3 Economic Forecast Indicators

When calculating the hybrid historical average, a benchmark for the projected year's demand should be based on leading economic forecast indicators.

3.4 Sustaining Pilot Proficiency

Sustaining a highly qualified, proficient, and professional pilot workforce involves many factors, including initial and sustainment training, recruitment, and retention. Investments to sustain the workforce are not visible or structured within in the ratemaking process.

3.4.1 Structured Training Programs

Training is an allowable expense, but the delay in reimbursement and the time-value of money do not promote the expense. The current ROI process also does not promote an investment in training.

Recommendation:

- Establish guidance on training programs managed by each association. The guidance should include:
  - Recurring training standards, including recommended courses and frequency. Recurring training can be scheduled during the off season. Training held during the season will either impact the scheduled time off for the pilots or increase the capacity requirements for pilots.
  - Documented programs for developing newly hired pilots and the expected time frames for doing so. Quotas for additional pilot capacity could then be included in the rates as part of the staffing standards.
- Adequately reflect the time-value of money for association expenses, and apply an inflation adjustment from the year of the audited expenses to the year of the ratemaking.

Recurring training recommendations from the pilot associations included courses in:

- Bridge Simulator Training (or manned module training)
- Rapid Radar
- Electronic Navigation
- Standards of Training, Certification and Watchkeeping (STCW)
- Bridge Resource Management
- Legal Aspects of Piloting

3.4.2 Recruitment and Retention

Concern is growing regarding the available candidate pool to replace pilots who will soon be retiring. Competition with other pilotage services and increased incentives to retain captains in the Great Lakes Carriers Association is making it difficult to find qualified and experienced pilot candidates.

Key concerns discussed with the pilot associations regarding recruiting included:

- Inability to compete at the same level of pay as other pilot associations.
- Poor quality of recent applicants.
- Longer training periods for pilots with fewer qualifications/less experience on the Great Lakes.
- Mismatch in expectations of workloads and pay causing pilots to leave the Great Lakes.

An evaluation of recruitment issues should be conducted to develop strategies to address the concerns above. The evaluation should include a look at:

- **Incentives to attract new pilots.** Although pay is perceived to be the leading motivator, quality of life, living standards, and job satisfaction are also leading factors and can outweigh the pay incentive.
- **Incentives to retain existing pilots,** including a statistical/historical review of pilot retention issues.
- **Adequacy of Coast Guard standards** to ensure qualified pilots.
- **Completeness of Coast Guard standards** to filter out less-qualified pilots or reduce the necessary training/qualification periods for new pilots.

3.5 Ratemaking Management/Governance

Determining pilotage rates on the Great Lakes is the only pilot ratemaking process in the United States overseen by a federal entity. International coordination with Canada is the primary need for federal oversight. The Great Lakes Pilotage Act of 1960 (46 U.S.C. Chapter 93) assigns responsibility to the Coast Guard to "prescribe by regulations rates and charges for pilotage services." The methodology for establishing pilotage rates is described in 46 CFR 404. The Coast Guard has adopted Appendix A – Ratemaking Analysis and Methodology as an annual practice to establish rates. Both the methodology and the processes for providing input to the ratemaking process are complicated and resource intensive and often obfuscate stakeholder issues.

3.5.1 Rate Multiplier Calculations

The current rate multiplier is determined by a collection of calculations to determine projected ROI. The projected ROI is compared, as a ratio, to the target ROI. If the projected ROI and target ROI are equivalent, the rate multiplier is 1, and no changes to the rate take place. If the projected ROI is less than the target ROI, then the ratio will be greater than 1 and the rates increased. Conversely, if the projected ROI is greater than the target ROI, the ratio will be less than 1 and the rates reduced.

This approach confuses the issues of ROI and the rate multiplier. As discussed in **Section 2.5: Target Rate of Return on Investments,** it is recommended that ROI calculation be applied to a percentage of the Investment Base included as part of the necessary revenue to recover. The use of ROI now provides a perception that it is related to the "profit" of the association. Presenting the rate multiplier calculation from a different perspective will further reduce this perception and directly relate the rate multiplier to the rates.

Recommendation:

Modify the rate multiplier calculation for each area as a ratio of the projected average revenue per assignment necessary to meet revenue required to the previous year's average revenue per assignment, as shown in **Figure 13: Simplified Presentation of Rate Multiplier Calculation.** The rate multiplier, in this context, is a direct ratio of the rate necessary to the current rate. If the rate necessary is higher than the current rate, the ratio will be greater than 1, and rates will need

to be increased to meet the projected revenue required. If lower, the rates can be reduced. Both components of the calculation are necessary to account for differences in revenue and demand between the years being compared.

For example, for the 2013 ratemaking process, the average revenue per assignment for 2011 was known. Adjusting this by the rate multipliers from 2012 provides and estimated average revenue per assignment for 2012. This is compared to the projected average revenue per assignment for 2013.

Carrying out the calculations in this manner produces the same results as the current ratemaking methodology, but it:

- Removes the dependence of ROI from determining the rate multiplier (which reduces the perception that ROI is related to profit of the associations); and
- Directly relates the rate multiplier to the ratio of two rates.

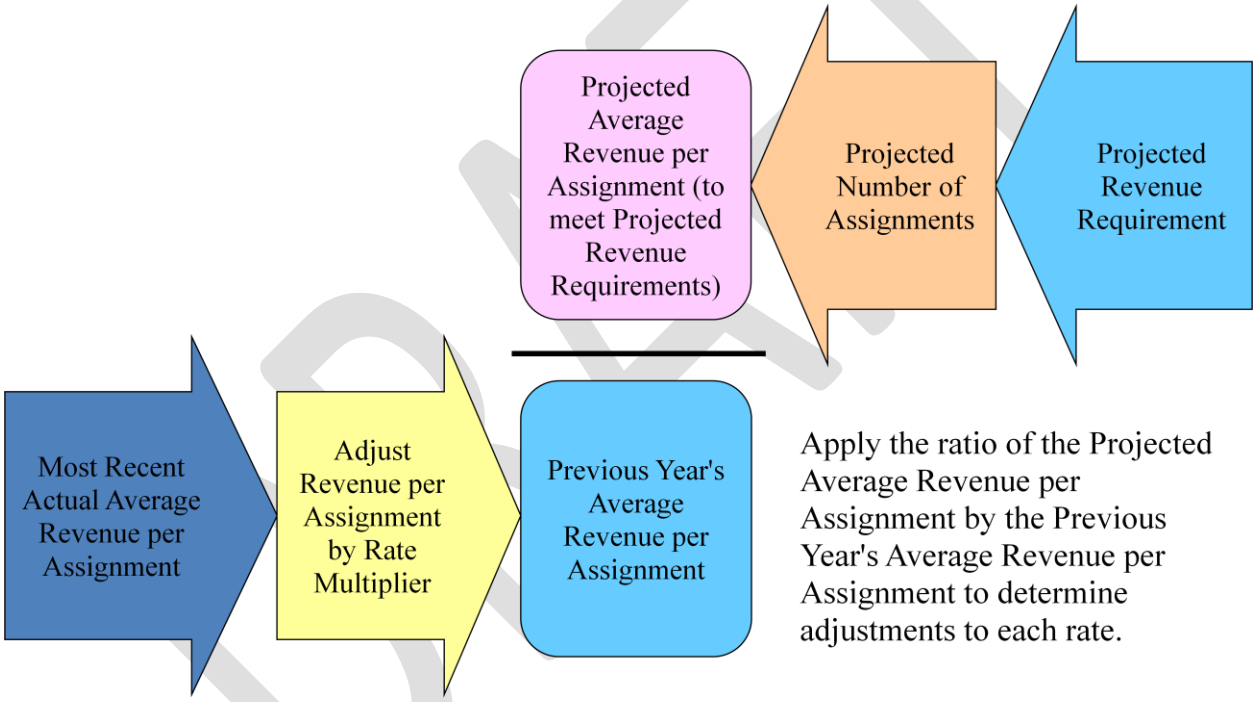


Figure 13: Simplified Presentation of Rate Multiplier Calculation

3.5.2 Business Risk

Within the ratemaking process, there is a perception that the application of the ROI calculation is managing profits – ensuring revenues are sufficient only to cover operating expenses, pilot compensation, and a reasonable return on investments. The discussion within the existing ratemaking process should be modified to make it clear that ROI is simply an additive component to projecting revenue required. However, there needs to be a component to reflect the variability in demand and the risk to business in anticipating and responding to that demand.

The recent history of demand projections has been higher than actual demand. This has resulted in pilot associations being unable to attain the projected demand and, hence, the projected

revenues. The Appendix A methodology only accounts for sufficient revenue to recover operating expenses, pilot compensation, and an ROI; there is no latitude should projections not be met. This places all the risk of not meeting projections on the pilot associations and is typically reflected in lower than expected compensation for pilots and an inability to acquire capital for investments.

The Business Risk Reserve will provide a mechanism for associations to set aside funds when projected demand is reached or exceeded. It also provides a buffer against excessively low demand to reduce the loss experienced by the association.[22] As shown in **Figure 14: Business Risk Reserve,** when projected demand is not realized, reduction in the Business Risk Reserve can be realized before impacting wages to pilots. The Business Risk Reserve would be tied to a benchmark and set at a reasonable percentage of expenses and compensation. Expenses and compensation are reviewed and verified during annual audits to ensure the Business Risk Reserve is applied only to recognized costs. The Business Risk Reserve percentage is applied to all costs (expenses and compensation) – a much larger figure than just the approved investment base – so it would eliminate the need to apply the ROI.

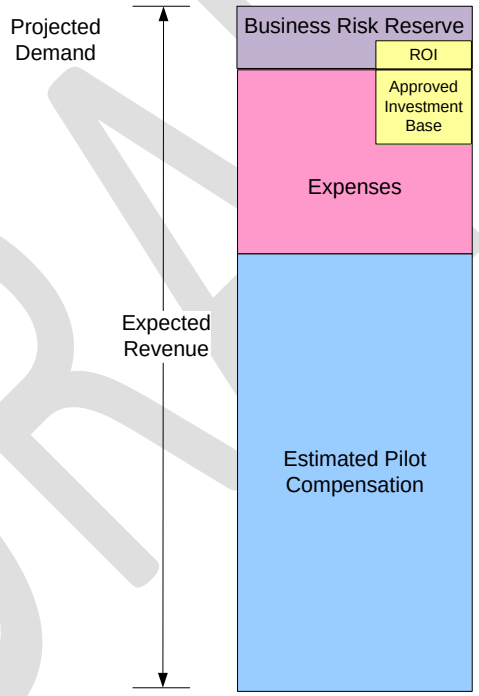


Figure 14: Business Risk Reserve

Projecting demand is not an exact science. Recognizing a Business Risk Reserve (and implementing a more reasonable approach to projecting demand) will result in generating sufficient revenue to cover expenses and estimated pilot compensation the majority of time. There will be times when experienced demand is significantly lower than projected demand and a loss will need to be absorbed. With an applied Business Risk Reserve, revenue generated should generally exceed the revenue requirements. This will allow the associations to realize a

[22] In an association, individual partners will be responsible for managing the Business Risk Reserve.

return on investment and provide a mechanism to generate capital to prepare for those periods when demand is excessively low and for further investments in infrastructure and training. Annual audits will continue to provide visibility into any revenue gaps or surplus.

An alternative would be to establish a program where any revenue gap or surplus from the audited year is considered in establishing rate – increasing the rates to recover a gap and reducing the rates if a revenue surplus occurred. Annual review of audits would provide visibility and validation of costs.

Recommendation:

A Business Risk Reserve corresponding to the Moody's Seasoned Aaa Corporate Bond Yield or more conservative indices used in other public investment scenarios is recommended as a benchmark. The Business Risk Reserve is based on estimated expenses and pilot compensation, which are verified through the audit process.

This Business Risk Reserve, in combination with adjusting the methodology to project demand, provides the associations a mechanism to respond to the risks associated with the uncertainty of projected demand. When projected demand is greater than traffic realized, the revenue gap is mitigated by the Business Risk Reserve. If projected demand surpasses the traffic realized in excess of the percentage of the Business Risk Reserve applied, the associations will operate at a loss for that year.

3.5.3 Ratemaking Governance and Review Process

Similar to the way in which rates are set for other state pilot associations within the United States, a dual-layered recommendation and approval process should be implemented that shifts the justification and proposal of rate modifications more to the stakeholders and reduces the role of the Coast Guard to review, approval, and adjudication as necessary. This approach opens communications among stakeholders and improves transparency and clarity of the process.

A similar process is followed by the Canadian pilot counterparts on the Great Lakes, where significant discussion on the justification and impact on modifications to the rate are discussed on a regular and open basis. Prior to review by the Coast Guard, pilots and industry would develop proposals and justifications on changes to rates and the impact of those changes. These discussion would be nonbinding and be carried out in a less-formal forum free from regulatory oversight. Those areas where subjectivity needs to be applied could be openly discussed and agreed upon. Even in those situations where an agreement is not reached, visibility is increased and a more transparent proposal for modifications developed. The pilots would present a business case for any rate modifications. Industry will provide a formal endorsement to the proposal from the pilot associations and submit it to the Director for final recommendation. Because of the contentious nature of the discussion, it is anticipated that a quorum would not be reached by GLPAC. However, a formal recommendation from GLPAC is recommended.

Specific guidance and procedures to calculate rates would be established (the Appendix A ratemaking methodology). Each stakeholder would be required to provide supporting justifications for any modifications, taking into consideration the following:

- Amount of activity, including number of vessels, number of pilot assignments, and size of vessels by tonnage, length, and draft;

- Any change in the amount of activity since the last rate order;
- Public interest in prompt and efficient service;
- Professional skills and experience required of a pilot and the difficulty and inconvenience of providing that service, including time necessary to perform the service;
- Evidence of compensation for comparable maritime professions, including other pilotage associations; and
- Total gross and net income for the pilots' group since the last rate order, including sources of income by rate category and individual amounts paid to pilots since the last rate adjustment, which may be shown as both gross and adjusted gross income as reported for tax purposes.

This will increase the visibility and transparency to stakeholders and could streamline resolution of some issues.

Recommendation:

A governance structure similar to that followed by Delaware, New York, and Alabama should emerge, with stakeholders taking a more active role in recommending and justifying modifications to rates. The Coast Guard will provide guidance on the bounds of acceptable adjustments to the rates and the required business justifications to accompany any recommended changes to rates. The pilot associations and industry discuss rates with one another and present recommended rates to the Director in a business case for final review and publication to the Federal Register. GLPAC meetings can be used as a forum for final discussion/facilitation. Parameters currently driving rates and areas of improvement for the overall system can be identified and reported out to the Director within the proposal brought forward from the pilots and endorsed by industry. Responsibilities associated with the current and proposed methodology are provided in **Figure 15: Example Ratemaking Process Responsibilities.**

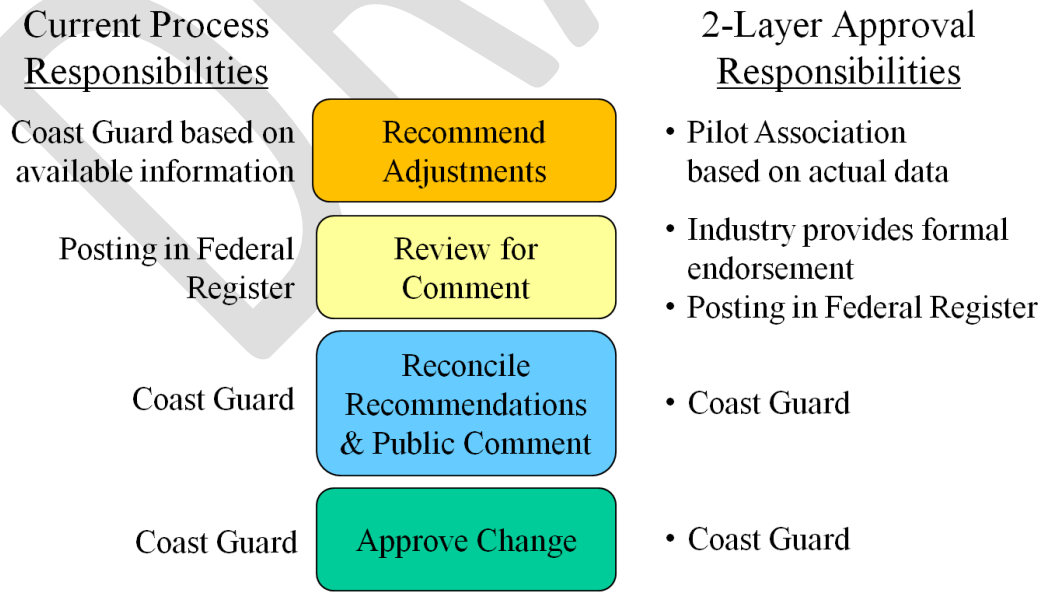


Figure 15: Example Ratemaking Process Responsibilities

3.5.4 Shared Services

Several services being performed by each pilot organization are redundant. Sharing those services would provide for more standardization and efficiency. Candidates for shared services are billing, dispatch, travel, and pilot boats. Discussions with each pilot association uncovered various approaches to these services, with no one District exercising the best practices across them all. A summary of these services was provided in the overview in **Table 1: U.S. Great Lakes Pilotage System Overview.**

Having local knowledge can make delivery of services more effective. What was observed during the visits to the pilot associations wasn't so much local knowledge as it was the personality of the individuals providing the service that made it effective. This personality-driven effectiveness will occur regardless of whether the services are provided locally or shared across Districts. Finding the right individuals to provide the service is more important than the location they provide the services from.

Billing

Complete and consistent billing data should be maintained in the Klein system and kept aligned to billing statements.

The three associations received billing support through administrative staff at 1% or less of total District revenues. There is a convenience to providing source forms directly to the billing entity without the need to transmit them to a remote location. Each of the individuals managing the billings for the associations did not perform this task on a full-time basis. From a staffing level perspective, there would be little gain in efficiency by centralizing this function.

Gains would be made from the perspective of consistent information recorded for each billing and increased accessibility. The Klein system does store information on billing, but we did not have access to that information. Each association was maintaining a separate information system to store, manage, and retrieve billing information. Increased consistency across the billing systems would simplify the audit process and increase the accessibility of billing information related to assignments performed.

There would be concerns from the associations regarding accounting functions being performed that should not be shared across associations. This could only be mitigated by combining the associations.

Dispatch

Dispatch services were being provided through a variety of methods:

- District 1 dispatch is provided from the Canadian GLPA.
- District 2 has a dispatch watchstander.
- District 3 has on-call dispatch services.

As a result, it is estimated that centralizing dispatch to a two-man watch may actually increase the cost to provide centralized dispatch service.

The issue regarding dispatch was the amount of trust each pilot vested in the dispatcher. This was directly related to the attitude of the individual providing the dispatch service. In some

cases, pilots sought additional sources and invested substantial time on their own to implement safeguards to:

- Ensure an assignment was not missed; and
- More effectively schedule assignments around their personal lives.

Consolidation of dispatch services would increase the integration and sharing of information across the associations. This would increase the level of "intelligence" of the overall system and provide more predictability of when vessels are arriving. Automatic notification of pilots based on up-to-date information maintained in the Klein system would keep the pilots better informed of upcoming assignments, decrease the amount of time spent monitoring traffic, and improve the quality of life during unscheduled time-off periods.

Travel

Each association had varying approaches to providing travel for their pilots, from fully contracted livery services to individuals driving personal vehicles. With the length of some of the overland travel distances, it is recommended that a livery service be used for all travel in excess of an hour and be optional for travel less than an hour. A cost-benefit analysis should be performed in District 3 to compare the cost of consuming pilot capacity with additional rest after pilots drive themselves to the cost of providing a livery service. Having pilots drive their own vehicles (or an association-owned vehicle) before or after an assignment impacts effective mandatory rest. Resting in a car may not be as effective as resting at home and increases risk. Having a pilot drive a car after a lengthy transit significantly increases risk. Travel Time is directly considered when determining the average Pilot Assignment Cycle in **Section 2.2: Seasonal Work Standard.** Travel and Mandatory Rest should be distinct times recorded in the Klein system.

Livery service most likely will not be available to service the entire Great Lakes. Individual services will need to be contracted for each District. Only a slight reduction in overhead effort would occur with one person managing three different contracts rather than three individuals managing separate contracts.

Pilot Boats

Pilot boat services are localized to each District, with District 3 contracting out all pilot boat services. Pilot boat services are currently shared at the common boundaries. District 3 receives pilot boat services from District 2 at Port Huron. The boundary between District 1 on Lake Ontario and District 2 on Lake Erie is separated by the Welland Canal, preventing shared services there. Maintenance of the boats also is carried out locally and would be impractical to centralize.

The only area that may possibly benefit from shared pilot boat operations would be the availability of standby boats. In the event of a long-term need for a replacement boat, a common replacement boat across the Districts could be staged where necessary. Short-term services could be contracted out until the replacement boat arrives (or the primary boat is repaired).

3.5.5 Klein System Information

More-accurate and timely information on actual pilot operations would support the above recommendations and future studies. The Klein system is used to manage assignments of pilots and maintain a history of activity within each area. The information in the system assists in determining actual utilization of pilots and supports analysis and performance measurement of the pilotage system within the Great Lakes. Issues associated with the Klein system identified in the course of this study include:

- Limited user instructions to support consistent entry of information.
- Inconsistent use of fields causing confusion on the characterization of each job.
- Pilot status reflecting whether a pilot is on the Tour de Role at a particular time or off the role for a particular reason and is not available (e.g., scheduled time off, sick, a meeting). This information would provide greater visibility into the impact on quality of life for pilots to be able to plan personal events.

Recommendation:

- Improve the completeness and accuracy of the information within the Klein system. Associations should not be maintaining separate sets of data and statistics.
- Establish validation procedures similar to the manner in which financial audits are conducted.
- Ensure "Bridge Hours" within the Klein system only encompass the time spent providing pilot services to the vessel (the new "Trip Time"), and use the "Delay" and "Detention" columns to record delays and detentions. The status code continues to capture cancellations.
- Establish rules to accurately capture data in the Klein system for pilot capacity consumption corresponding to the terminology provided in **Section 2.1: Clarifying Terminology** and all of the components to calculate the standard discussed in **Section 2.2: Seasonal Work Standard** (e.g., pilot boat travel, mandatory rest). This may require additional information to be recorded for each job in the Klein system, but it would provide a record of the consumption of pilot capacity.
- Enter a notation into the Klein system when a pilot begins and ends Scheduled Time Off. If Scheduled Time Off is involuntarily interrupted, a note should be placed in the record. This will provide a means to monitor how often this situation is occurring and support decisions to adjust the number of pilots.
- Include a field for amount billed for each job/invoice. This will not only support the billing process but will also provide insight into the true revenue generated for each pilotage service (each job record within the Klein system). For this analysis, estimated charges were determined based on interpretation and assumptions of each leg and assignment of a pilotage charge. Actual charges would have made the estimates more accurate.
- Update the User Instructions, and provide guidance on assignment of codes and values within the Klein system to improve consistency across the data. For example, the "Delay" field is a key consideration in determining the number of pilots necessary. Having accurate information on this enables better monitoring of the number of pilots necessary.

- Provide a better indicator in the Klein system of which hours are training and which are invoiced. This, combined with information on how much is invoiced with each job, will provide more-accurate estimates of the actual revenue generated.

4. RECOMMENDATIONS

The collection of recommendations to address the problem areas are summarized in this section. Recommendations are interrelated, and groupings presented here take into consideration those relationships. Implementing a single recommendation must consider the implications of not implementing the related recommendations.

A phased implementation approach would permit an opportunity to assess the effectiveness of a collection of recommendations before implementing another set of recommendations. Performance measures can be identified prior to implementation to support that assessment. The assumptions, analysis, and even possibly some of these recommendations should be revisited prior to the implementation of the next phase.

Overall, these recommendations provide a more objective ratemaking system based on data (both performance and operational) and benefit the stakeholders as summarized in **Table 33: Stakeholder Benefits.** This more-objective approach to the ratemaking process will help stabilize it from year to year, institute self-correcting mechanisms, and provide stakeholders the ability to forecast and plan. The contributions of each of these recommendations to safety, efficiency, cost, and the ratemaking process are summarized in **Table 34: Recommendations Supporting Safety, Efficiency, Cost, and the Ratemaking Process.**

Table 33: Stakeholder Benefits

U.S. Coast Guard/Public Interest	Industry	Pilots
• Reduce Systemic Risk • Simplify Ratemaking Process • Increase Transparency	• Stable and Predictable Rates • Improve Pilot Training • Reduce Pilot Turnover • Efficient and Reliable Pilotage	• Increase Compensation • Safer Work Environment • Defined Seasonal Work Standards • Historical Data for Projections • Close Revenue Gap

Table 34: Recommendations Supporting Safety, Efficiency, Cost, and the Ratemaking Process

	Safety	Efficiency/ Reliability	Cost	The Ratemaking Process
Clarify the Ratemaking Terminology (Section 2.1)		✓		✓
Define the Seasonal Work Standard for Pilots (Section 2.2)	✓		✓	✓
Staffing Levels (Section 2.3)	✓	✓	✓	✓
Use a 3-year Hybrid Historical Average to Project Demand (Section 2.3.1)		✓	✓	✓
Estimate Staffing Levels Based on Average and Standard (Section 2.3.2)	✓		✓	✓
Modify the Billing Scheme (Section 2.4)	✓	✓	✓	✓

	Safety	Efficiency/ Reliability	Cost	The Ratemaking Process
Retain the Target Rate of Return on Investment Benchmark (Section 2.5)	***No change***			
Pilots and Industry Agree on Reasonable Pilot Compensation (Section 2.6)			✓	✓
Modify the Projected Revenue Calculation (Section 3.2.2)			✓	✓
Baseline the Tariff Card (Section 3.2.4)			✓	
Modify the Rate Multiplier Calculation (Section 3.5.1)				✓
Account for the Time Value of Expenses (Section 3.2.3)			✓	✓
Allow for Business Risk Reserve (Section 3.5.2)			✓	
Adjust the Ratemaking Governance and Review Processes (Section 3.5.3)				✓
Mitigate Long Assignments in Area 6 (Section 3.1.2)	✓			
Conduct a Full Risk Assessment (Section 3.1.4)	✓	✓		
Establish a Structure Training Program (Section 3.4.1)	✓			
Evaluate Recruitment and Retention (Section 3.4.2)	✓			
Identify Shared Services (Section 3.5.4)		✓	✓	
Enhance Available Information in the Klein System (Section 3.5.5)		✓	✓	✓
Update Association Work Rules (Section 3.1.1)	✓	✓	✓	

Implementation of some of these recommendations will require either coordination with Canada or modifications to the U.S./Canadian Memorandum of Arrangements.

Each of these recommendations proposes a methodology to be applied. In order to carry out that methodology, processes need to be identified along with specific activities and responsibilities (to enhance the governance structure of the ratemaking process). Many of the processes require up-to-date data. Some of the proposed methodologies also suggest benchmarks for that data. At the time of implementation, the data and benchmarks recommended will need to be revisited to ensure they are accurate and applicable before being applied to the methodology.

4.1 Address Hidden Risks

Setting appropriate staffing standards is the lead recommendation to address the hidden risks in the system. Appropriate staffing levels reflect sufficient pilots to meet demand (to avoid delays) within reasonable workloads (to avoid fatigue-related risks). In order to determine appropriate staffing levels objectively, a seasonal work standard for pilots, and a reasonably accurate projection of demand are required. The seasonal work standard is objectively determined in terms of pilot capacity. Pilot capacity is more clearly defined when taking into consideration, clearly defining, and removing dependencies of the terms within the system. Therefore, the following recommendations are highly dependent on one another:

- Clarify Ratemaking Terminology (**Section 2.1**).
- Define Seasonal Work Standard for Pilots (**Section 2.2**).
- Estimate Staffing Levels Based on a Hybrid Historical Average for projecting demand and the seasonal work standard – tailoring the efficiency factor to meet 90% of the experienced demand (**Section 2.3**).

Although it is not necessary to transition to a system based on assignments in order to implement the above, it is highly recommended. The methodology proposed for establishing the seasonal work standard resulted in a justified standard for each area equivalent to the current "Bridge Hours" (see "Expected Trip Time" in **Table 11: Example 50% Expected Pilot Utilization**). However, this standard was only arrived at by considering the seasonal work standard in terms of "assignments." Transitioning to establishing standards and projections in terms of "assignments" strengthens the coupling between demand, required revenue, pilot capacity, and established tariffs. It is highly recommended that if the 1,000/1,800 Bridge Hour standard is modified, this transition to "assignments" is carried out at the same time.

Applying the recommended terminology of **Section 2.1: Clarifying Terminology,** a seasonal work standard can be determined by taking into consideration the activities associated with performing a pilotage assignment for each area. The average time to complete those activities, along with Work Rules for Mandatory Rest and Scheduled Time Off, can be used to determine the maximum number of assignments possible within the season. An efficiency factor can be applied to this maximum to determine a reasonable number of assignments a pilot can complete in a season.

Better projections of demand can be obtained by using the most recent past information on demand. To compensate for potential changes in the demand and offset the lag associated with a historical average, a hybrid historical average can be used, where a single year's forecast is included in the average. The single year's forecast should be a reasonable delta based on economic conditions.

Dividing the projected demand by the seasonal work standard provides an estimate for the staffing levels. This estimate can then be checked against the distribution of concurrent jobs in a season to determine if sufficient pilots will be on the Tour de Role (compensating for Scheduled Time Off) to respond the majority of peak demands

As an example, **Table 35: Example Impact on Revenue Requirement Applying Hidden Risk Recommendations** reflects the impact on the projected revenue required using the seasonal work standard and the hybrid historical average methodologies to determine an appropriate staffing level and then adjusting the staffing level based on an analysis to meet 90% of the previous year's demand. The parameters within the 2013 FR are provided for comparison. One additional pilot is added to the system, causing an increase in the revenue required.

Table 35: Example Impact on Revenue Requirement Applying Hidden Risk Recommendations

		Staffing Level (Pilots)		Seasonal Work Standard (Assignments/Pilot)		Projected Demand (Assignments)		Revenue Required	
		2013 FR Ratemaking	Example	2013 FR Ratemaking	Example	2013 FR Ratemaking	Example	2013 FR Ratemaking	Example
D1	Area 1	6	7	129	81	677	629	$1,952,054	$2,169,952
	Area 2	5	7	174	70	535	451	$1,302,166	$1,619,549
	Total:	**11**	**14**			**596**	**451**	**$3,254,220**	**$3,789,500**
D2	Area 4	4	5	163	68	619	330	$1,185,096	$1,343,789
	Area 5	6	6	166	86	850	562	$2,144,112	$2,144,112
	Total:	**10**	**11**			**736**	**451**	**$3,329,208**	**$3,487,901**
D3	Area 6	7	7	80	50	509	426	$1,907,881	$1,907,881
	Area 7	4	3	163	85	528	223	$1,254,936	$1,037,026
	Area 8	6	4	83	46	442	205	$1,460,433	$1,143,042
	Total:	**17**	**14**			**502**	**451**	**$4,623,250**	**$4,087,948**
		38	**39**			**1,833**	**1,353**	**$11,206,678**	**$11,365,350**

Supporting factors to objectively determining pilot capacity are clear, consistent, and up-to-date Pilot Association Work Rules (**Section 3.1.1**). The update to the Work Rules can also incorporate clearer safety guidance on when a pilot change at Iroquois Lock should take place (**Section 3.1.3**).

To identify hidden risks in the system, a full risk assessment should be conducted (**Section 3.1.4**). In the course of this analysis, the long assignments in Area 6 were identified as a lead risk and can be mitigated by carrying an additional pilot on the long transits between Lake Huron and Lake Michigan (**Section 3.1.2**).

4.2 Close the Revenue Gap

The revenue gap (the gap between actual revenue generated and the projected revenue) has been the leading source of concern and angst among the pilots. Several factors in the current ratemaking process directly contribute to this, mostly as a result of making projections based on the previous year's projection, which may (and historically has been) in error. Using available data to re-baseline these ratemaking parameters on a regular basis will help mitigate the revenue gap:

- Project demand based on a hybrid historical average (**Section 2.3.1**). Use the most recent two years of historical data (with a year-to-date estimate for the most recent year), and average with a single year's forecast for demand benchmarked against economic forecast factors for the upcoming season to calculate the projected demand.

- Adjust the calculation for projecting revenue (**Section 3.2.2**). Use the most recently available data set and audited revenues to determine the average revenue generated. The average revenue generated is then multiplied by the projected demand to project revenue generated.
- Account for the Time-Value of Expenses (**Section 3.2.3**). Apply the inflationary factor for each year from the year of the audit to the year of ratemaking.

The first two recommendations affect the projection of revenue generated. The revenue generated is compared to the revenue required to determine if sufficient revenue will be generated. If not, the rates are scaled so that the projection for the revenue generated is equivalent to the revenue required. **Table 36: Example Impact on Projected Revenue Generated** provides an example comparison between the results of projecting revenue under the current ratemaking processes and the recommended approach. The average hourly pilotage rate is currently an estimate based on the previous year's estimated average revenue per hour. That is multiplied by the projected bridge hours to project the revenue generated. The proposed recommendations use actual traffic demand and reported revenues to calculate the average revenue generated per assignment. This is multiplied by the projected demand using the recommended hybrid historical average to project the revenue generated. Example projected revenue generated can be compared to the revenue required in **Table 35: Example Impact on Revenue Requirement Applying Hidden Risk Recommendations**. The disparity between revenue generated and revenue required was identified in Step 7 of the 2013 FR. The Coast Guard exercised is discretionary authority to minimize the impact of this disparity. The example illustrates that a revenue gap of 13.8% of projected revenue generated exists, which would require an increase in tariffs to close.

Table 36: Example Impact on Projected Revenue Generated

		Average Revenue		Projected Demand		Projected Revenue Generated	
		2013 FR 2012 Pilotage Rates ($/hr)	Example Actual 2012 Pilotage Rates ($/Assignment)	2013 FR Ratemaking (hrs)	Example Hybrid Historical Average (Assignments)	2013 FR Ratemaking	Example Using Actual 2012 Pilotage Rates and Hybrid Historical Average to Project Demand
D1	Area 1	$467.58	$3,252.66	5,216	629	$2,438,897	$2,045,926
	Area 2	$289.72	$3,010.01	5,509	451	$1,596,067	$1,357,514
	Total:			**10,725**	**1,080**	**$4,034,965**	**$3,403,439**
D2	Area 4	$188.54	$3,483.52	6,814	330	$1,284,712	$1,149,560
	Area 5	$504.11	$2,967.00	5,102	562	$2,571,969	$1,667,457
	Total:			**11,916**	**892**	**$3,856,681**	**$2,817,017**
D3	Area 6	$191.69	$4,627.78	11,411	426	$2,187,375	$1,971,433
	Area 7	$480.26	$3,364.85	3,223	223	$1,547,878	$750,361
	Area 8	$183.87	$5,094.52	9,540	205	$1,754,120	$1,044,377
	Total:			**24,174**	**854**	**$5,489,372**	**$3,766,172**
				46,815	**2,826**	**$13,381,018**	**$9,986,628**

The third recommendation addresses the application of the inflationary indicator to all years from the audit to the ratemaking year. For the 2013 ratemaking process, this would include an additional adjustment for inflation in 2012. An example is shown in **Table 37: Example Impact on Revenue Required Adjusting for 2012 Inflation.** The CPI-U for the overall Midwest Region of the United States (found at www.bls.gov/ro5/cpi-mid.htm) for 2012, from December to December (not seasonally adjusted) was 1.8%. This additional inflationary factor is applied only to operating expenses. Based on the example, the revenue gap increases to 14.5% of estimated revenue generated.

Table 37: Example Impact on Revenue Required Adjusting for 2012 Inflation

		Expenses			
		2013 FR Ratemaking	2013 FR Ratemaking Less Investment Interest	Example Expenses Adjusted for 2011 Inflation (CPI 1.8%)	2013 Revised Required Revenue
D1	Area 1	$644,610	$598,805	$655,388	$2,180,730
	Area 2	$508,691	$472,540	$517,196	$1,628,054
	Total:	**$1,153,300**	**$1,071,344**	**$1,172,585**	**$3,808,785**
D2	Area 4	$550,319	$535,541	$559,959	$1,353,429
	Area 5	$836,670	$803,312	$851,129	$2,158,572
	Total:	**$1,386,989**	**$1,338,853**	**$1,411,088**	**$3,512,000**
D3	Area 6	$797,017	$754,254	$810,593	$1,921,458
	Area 7	$383,308	$362,742	$389,837	$1,043,555
	Area 8	$508,266	$480,996	$516,924	$1,151,700
	Total:	**$1,688,590**	**$1,597,991**	**$1,717,354**	**$4,116,712**
					$11,437,497

In 2011, the revenue gap across the entire system was 27.6% of the projected revenue. The GLPAC recently approved modification of the ship weighting factors based on pilotage units to align with the Canadian weighting factors. This will increase the majority of ships with a weight factor of 1.00 to 1.15. Based on 2011 traffic distributions from the Klein system, it is estimated this will result in a 6% increase in revenue. This will offset the 14.5% revenue gap found with the example calculations above.

Additional recommendations in support of further closing the revenue gap are associated with adjusting the determination of tariffs:

- Migrating to more point-to-point billing (**Section 2.4**) will increase the coupling between the tariffs, demand, and revenue generated.
- Baselining the tariff card on a regular basis (**Section 3.2.4**) will ensure the rates are more reflective of the traffic distribution. Using a baselined tariff card in the ratemaking process will provide better revenue projections.

4.3 Establish Ratemaking Benchmarks

Establishing benchmarks increases the objectivity of the process and provides justification for those areas in the ratemaking process where judgment is applied. These benchmarks provide comparative insight and support the application of judgment in the process. Recommended benchmarks in the ratemaking process are:

- Continue with Target Rate of Return based on Moody's Seasoned Aaa Corporate Bond Yield (**Section 2.5**). This rate is reflective of low risk and medium liquidity and is not adjusted for inflation investment type of public entities.
- Pilots and industry negotiate a reasonable level of compensation and the impact on the rate. (**Section 2.6**).
- It is recommended that a hybrid historical average be used to calculate projected demand (**Section 2.3.1**). A one-year projection is averaged with historically experienced demand. The one-year projection is an increase/decrease from the previous year. The increase/decrease is benchmarked against available economic forecasts.

4.4 Sustain Pilot Proficiency

Evaluating recruitment and retention issues (**Section 3.4.2**) will identify the key issues surrounding the ability to attract and retain highly qualified individuals. This supports maintaining safety standards and performance.

Establishing a structured training program (**Section 3.4.1**) sustains the proficiency of pilots in support of continue and enhanced safety of pilotage services.

4.5 Improve System Management

Recommendations that improve the objectivity, transparency, and clarity of the ratemaking process are:

- Modify the rate multiplier calculation (**Section 3.5.1**) to improve the clarity of the calculations and illustrate that the rate multiplier is an adjustment factor to adjust the estimated revenue to the required revenue.
- Allowing for Business Risk Reserve (**Section 3.5.2**) shares the risks of not achieving required revenue among the stakeholders.
- Adjust the ratemaking governance and review process (**Section 3.5.3**), shifting the governance of the process more toward the GLPAC, with oversight, review, and approval by the Coast Guard. Justifications for any rate increases are developed by the stakeholders and presented for final approval by Coast Guard.
- Identifying shared services (**Section 3.5.4**) improves the efficiency and cost of providing pilotage services, leverages best practices across the three Districts, and integrates operations.
- Enhancing available information in the Klein system (**Section 3.5.5**) supports the objectivity of the system. The recommendations of this report increase the reliance on actual data to support the process. Improving the completeness and accuracy of the information in the Klein system will provide better data.

As an example, the 2012 Moody's Seasoned Aaa Corporate Bond Yield of 4.64% is used as a benchmark and applied to the operating expenses and pilot compensation (the required revenue in **Table 37: Example Impact on Revenue Required Adjusting for 2012 Inflation**). This results in an additional 4.64% increase in rates across the system.

APPENDICES

APPENDIX A. GLOSSARY AND REFERENCES

The following sections provide a list of acronyms and terms used in this document and their definitions.

A.1 Acronyms

Acronym	Description
AMO	American Maritime Officers
BLS	U.S. Bureau of Labor Statistics
CFR	U.S. Code of Federal Regulations
CG-WWM-2	U.S. Coast Guard Great Lakes Pilotage Division
CPI	Consumer Price Index
CPI-U	CPI for All Urban Consumers
CPI-W	CPI for Urban Wage Earners and Clerical Workers
CPMS	Civilian Personnel Management Service
DDC	Delays, Detentions, and Cancellations
DOT	U.S. Department of Transportation
ECI	Employment Cost Index
FR	Final Ruling
FY	Fiscal Year
GLPA	Great Lakes Pilotage Authority (Canadian governance body)
GLPAC	Great Lakes Pilotage Advisory Committee
LCA	Lake Carriers' Association
LPA	Lakes Pilots Association Inc.
MOA	Memorandum of Agreement
MSI	MicroSystems Integration, Inc.
NPRM	Notice of Proposed Rulemaking

Acronym	Description
ROI	Return on Investment
SLSPA	St. Lawrence Seaway Pilots' Association
STCW	Standards of Training, Certification and Watchkeeping
U.S.C.	United States Code
USGLSA	U.S. Great Lakes Shipping Association
WGLPA	Western Great Lakes Pilots Association
YTD	Year to Date

A.2 Terms

Term	Definition
Bridge Hour	The number of hours a pilot is aboard a vessel providing basic pilotage service. 46 CFR 404, Appendix A, Step 2.B(1)
Bridge Hour Standard	The number of bridge hours a pilot is expected to work in one season.
Business Risk Reserve	An amount of revenue remaining after deducting operating expenses and pilot compensation to account for the risk assumed in demand variances.
Cancellation	A U.S. pilot reports for duty as ordered and the order is canceled. 46 CFR 401.420(c)
Compensation	The total of wages and benefits.
Detention	"[W]henever the passage of a ship in interrupter and the services of a U.S. pilot are retained during the period of the interruption or when a U.S. pilot is detained onboard after the end of an assignment for the convenience of a ship…" 46 CFR 401.420(a)
Delay	"[W]hen the departure or movage of a ship for which a U.S. pilot has been ordered is delayed for the convenience of the ship for more than one hour after the U.S. pilot reports for duty at the designated boarding point or after the time for which the pilot is ordered, whichever is later…" 46 CFR 401.420(b)
Director of Great Lakes Pilotage	U.S. Coast Guard representative within the office of WWM-2 that regulates pilotage fees on the Great Lakes.
Earnings Before Taxes	Operating Profit/(Loss), less the Interest Expense. 46 CFR 404, Appendix B
Estimated Pilot Compensation	An estimate made by the government on annualized compensation for the Great Lakes pilots; includes both wages and benefits for the purpose of estimating rates.
Federal Tax Allowance	The federal statutory tax on Earnings before Tax, for those Associations subject to federal tax. 46 CFR 404, Appendix B
Interest Expense	The reported Association interest expense on operations, as adjusted to exclude any interest expense attributable to losses from non-pilotage operations. 46 CFR 404, Appendix B

Term	Definition
Investment Base	The net recognized capital invested in the Association, including both equity and debt. Should capital be invested in other than pilotage operations, that capital is excluded from the rate base. In general, it is the sum of available cash and the net value of real assets, less the value of land. The investment base is established through the use of the balance sheet accounts, as amended by material supplied in the Notes to the Financial Statement. 46 CFR 404, Appendix B
Movage	"The underway movement of a vessel in navigation from or to a dock, pier, wharf, dolphins, buoys, or anchorage other than a temporary anchorage for navigational or traffic purposes in such manner as to constitute a distinct separate movement not a substantive portion of a translake movement on arrival or departure, within the geographic confines of a harbor or port complex within such harbor." 46 CFR 401.110 (a) (4)
Net Income	The Earnings before Tax, less the Federal Tax Allowance. 46 CFR 404, Appendix B
Operating Expenses	The sum of all operating expenses incurred by the Association for pilotage services, less the sum of disallowed expenses. 46 CFR 404, Appendix B
Operating Profit/(Loss)	Operating Revenue less Operating Expense and Target Pilot Compensation. 46 CFR 404, Appendix B
Operating Revenue	The sum of all operating revenues received by the Association for pilotage services, including revenues such as docking, movage, delay, detention, cancellation, and lock transit. 46 CFR 404, Appendix B
Pilot Assignment Cycle	The collection of mandated activities to complete an assignment making the pilot unavailable for another assignment.
Pilotage Delay	A delay resulting from the unavailability of a pilot when the vessel is ready to get underway or continue underway at a pilot change point.
Previous Year's Pilotage Rate	An average hourly rate per bridge hour calculated by taking the Previous Year's Pilotage Rate and multiplying it by the rate multiplier for that previous year (e.g., the 2012 Pilotage Rate is calculated by taking the 2011 Pilotage Rate and multiplying it by the 2011 rate multiplier).
Projected Demand	The anticipated demand for pilotage service for the upcoming season.
Projected Operating Expenses	Audited operating expenses from a previous year escalated for inflation.
Projected Revenues	The anticipated revenues from pilotage fees based on the projected demand multiplied by the Previous Year's Pilotage Rate.

Term	Definition
Return Element	The Net Income, plus Interest Expense. The return element can be considered the sum of the return to equity capital (Net Income), and the return to debt (Interest Expense). 46 CFR 404, Appendix B
Return on Investment	The Return element, divided by the Investment Base, and expressed as a percent. 46 CFR 404, Appendix B
Seasonal Work Standard	The amount of time a pilot is expected to be engaged in activities throughout the season, including hours actively involved in piloting a vessel (Trip Time), travel, mandatory rest, scheduled/unscheduled time off, and delays and detentions.
Staffing Level	The number of pilots estimated to meet the projected demand.
Target Compensation	"The compensation that pilots are intended to receive for full time employment. For pilots providing services in undesignated waters, the target pilot compensation is the average annual compensation for first mates on U.S. Great Lakes vessels. For pilots providing services in designated waters, the target pilot compensation is 150% of the average annual compensation for first mates on U.S. Great Lakes vessels." 46 CFR 404, Appendix B
Target Rate of Return on Investment	An "allowable" or "reasonable" ROI rate currently determined by Moody's Seasoned Aaa Corporate Bond Yield.
Time on Assignment	Necessary and reasonable time spent to execute an assignment. In the case of a cancellation, those activities completed are considered Time on Assignment. This includes: • Travel to/from a designated pilot homeport or base to the point of embarkation/debarkation • Trip Time • Delay or detention
Trip Time	The time spent aboard the vessel in the course of providing pilotage services. In the case of designated waters, it is expected the entire time providing pilotage services is spent on the bridge "direct[ing] the navigation of the vessel subject to the customary authority of the master." For undesignated waters, this is a combination of Time on Bridge and Time "Available to direct the navigation of the vessel at the discretion of and subject to the customary authority of the master." (quoted sections from 46 U.S.C. 9302(a)(1))

A.3 References

1. 46 CFR 401: "Rates for Great Lakes Pilotage Rates Series" (December 1998 – August 2012).
2. 33 CFR 404 and 407: "Seaway Regulations and Rules: Great Lakes Pilotage Rates" (February 1997).
3. 33 CFR 404 and 407: "Seaway Regulations and Rules: Great Lakes Pilotage Rates" (September 1996).
4. 46 CFR 403 and 404: "Great Lakes Pilotage Rate Methodology" (May 1996).
5. 46 CFR 401, 403, and 404: "Great Lakes Pilotage Rate Methodology" (April 1995).
6. 46 CFR 401, 403, and 404: "Great Lakes Pilotage Rate Methodology" (April 1994).
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APPENDIX B. DETAILED ALTERNATIVE ASSESSMENTS

A detailed assessment of alternatives, as discussed in **Section 1.7: Evaluation Criteria,** is presented here with values assigned to each of the criteria. Each table provides the corresponding section number for the discussion within the body of the text, and a summary of the alternatives is provided from that discussion. Only a summary of these assessments is presented in the body of the report.

Alternatives are assessed against the criteria and assigned a positive or negative value based on the alternative's impact on the criteria. Additionally, a statement of risk associated with each alternative is provided in each area as well as an overall risk statement for the chosen recommendation. A summary of the alternative assessment is presented in the body of the report with each recommendation.

The following criteria will be evaluated in the areas of safety, efficiency, cost, and the ratemaking process. For each area, a risk narrative will be provided to address the components of risk in that area – threat, vulnerability, and consequence. An overall comment narrative provides clarification of the evaluation.

Safety

The risk statement will address to what extent the probability of an occurrence is increased or decreased and how the consequences can be mitigated through experience and appropriate reaction to an occurrence. Risks arise from fatigue, practices, and proficiency. The following criteria will be used to assess safety:

- **Fatigue Standards** – Fatigue associated with the current assignment, cumulative fatigue over multiple assignments, and cumulative fatigue over the entire season.
- **Managed Operating Risk** – There is no incentive created to take unnecessary risks to rush through a job or not adequately compensating for weather and traffic.
- **Reasonable Workload** – Pilots are able to adequately prepare for an upcoming assignment, including sufficient recuperative rest.
- **Qualified and Experienced Pilots** – Retain and recruit well-qualified and experienced pilots. Be able to develop experience for recruits and retain the experience of pilots on the Great Lakes.
- **Currency and Proficiency** – Sustain and improve the competency and proficiency of the pilots through regularly scheduled training programs.

Efficiency/Reliability

The risk of impacting the efficiency of the system (e.g., delays or adverse movements) will be summarized across the following criteria:

- **Minimize Delay** – The probability and frequency of delays occurring is mitigated. This includes delays by vessels and by pilots.
- **Sufficient Pilot Capacity** – Capacity balances the minimum number of pilots to manage costs and a maximum number in order to respond to surges in demand. A sufficient amount

of excess capacity is desired in order to respond to surge demands. It also compensates for training and certification for new pilots and sustaining a qualified and proficient workforce.

- **Efficient Movement of Vessels** – Vessels move through the system at an efficient speed; slow movers are discouraged. Practices impacting the efficient use of pilot and vessel time are discouraged.

Cost

Risks associated with increasing costs and losing competitiveness with other modes of transportation will be summarized, as well as the impact on running both a shipping and pilotage business in the context of the following criteria:

- **Reasonable Rates** – Rates remain competitive. Rates respond to variability in demand and avoid excessive loss or unreasonable profits for the associations. Rates are proportional to providing efficient services. Additional costs are associated with an increase in performance/ efficiency of the system.
- **Stable Rates** – Rates don't fluctuate dramatically from year to year and are predictable.
- **Fair Pilot Compensation** – Factors to ensure compensation to the pilots is accurate, comparable to other similar occupations, and reflective of the cost of living in the area and level of expertise and professionalism expected. The number of pilots is not excessive.
- **Adequate Cost Recovery** – Estimates of costs and revenue are reasonable.

The Ratemaking Process

The risks associated with the ability for the process to inform and engage stakeholders, to promote improvement, reduce conflict, and produce acceptable results will be addressed in the following criteria:

- **Stability/Repeatability –** Large fluctuations in results are minimized. The process produces acceptable, repeatable, and predictable results. Given the same circumstances and interpreted by different individuals, a comparable result is achieved.
- **Transparency –** Information used in the ratemaking process or decisions made during the ratemaking process are readily traceable to information available to stakeholders.
- **Simplicity –** The ratemaking process reduces calculations and the need for complicated explanations. There is clarity and consistency of terminology and values across stakeholders.
- **Accounts for Interdependencies –** Impact of values is confined to a single part of the ratemaking calculation as much as possible. Interdependencies are identified and influences managed.
- **Promotes Investments** – There is a motivator to invest in the system, maintain a high level of safety, increase efficiency, and manage the cost of providing piloting services. This includes sustaining training programs to invest in the proficiency of the pilots.

Each alternative is assessed against each of the criteria and assigned a numerical value based on the alternative's positive or negative impact on that criterion. **Table B-1: Alternative Assessment Values** describes the thresholds used to assign a value. These values reflect the positive or negative impact and the degree of certainty of that impact.

Table B-1: Alternative Assessment Values

Numerical Evaluation Assignments for Each Criteria	
+5	Strong or compelling alternative with long-term implications for the ratemaking process.
+3	Significant justification exists to exercise the alternative.
+1	An acceptable alternative that may provide some benefit.
0	No impact on the current state.
-1	The alternative may negatively impact the results of the ratemaking process.
-3	The alternative will definitely negatively impact the results.
-5	The alternative will adversely impact the safe and efficient delivery of pilot services.

The total sum for each of the four assessment areas (Safety, Efficiency/Reliability, Cost, and Ratemaking Process) will be presented and color-coded based on the following:

- No coloring – Little impact (+/- 2 points or less)
- Yellow – Some impact in the negative direction (5 points or less)
- Red – Significant overall negative impact (greater than 5 points) or an evaluation of -5 points in any one criterion.
- Green – Positive impact (5 points or greater) or an evaluation of +5 points in any one criterion with no other criteria being evaluated at -5 points.

B.1 Clarifying Definitions

This evaluation is only scoped to providing an alternative, clearer set of terms and definitions used in the ratemaking process.

Alternative 1: Include delays, detentions, and cancellations (DDC) in the definition of "Bridge Hour."

Alternative 2: Provide clarification and separation of terms used.

Table B-2: Assessment Supporting Section 2.1: Clarifying Terminology

	Alt 1	Alt 2	Risk Statement
Safety			**Risk to Safety**
Fatigue Standards			N/A
Managed Operating Risk			
Reasonable Workload			
Qualified and Experienced Pilots			
Currency and Proficiency			
Efficiency/Reliability			**Risk to Efficiency/Reliability**
Minimize Delay			N/A
Sufficient Pilot Capacity			
Efficient Movement of Vessels			

	Alt 1	Alt 2	Risk Statement
Cost			**Risk to Cost**
Reasonable Rates			N/A
Stable Rates			
Fair Pilot Compensation			
Adequate Cost Recovery			
Ratemaking Process	-7	7	**Risk to the Ratemaking Process**
Stability/Repeatability	-1	3	Ambiguity of terms risks inconsistent use. Clearer definitions separate the application of each term in the process.
Transparency	0	0	
Simplicity	-1	1	
Accounts for Interdependencies	-5	3	
Promotes Investments	0	0	
Overall Assessment	-8	8	
Comment: This assessment is scoped to just the terminology. The impact on the ambiguity of the terms in other areas will be addressed in the appropriate section of the report.			

B.2 Seasonal Work Standard

Alternatives for the seasonal work standard revolve around the inability to achieve 100% efficiency in scheduling the maximum possible assignments in a season. Alternatives include:

Alternative 1: 60% expected efficiency factor

Alternative 2: 50% expected efficiency factor

Alternative 3: 40% expected efficiency factor

Table B-3: Assessment Supporting Section 2.2: Seasonal Work Standard

	Alt 1	Alt 2	Alt 3	Risk Statement
Safety	3	5	5	**Risk to Safety**
Fatigue Standards	1	3	3	Current work standards difficult to obtain. Pilots feeling fatigued and taking risks to achieve standards. Standard not benchmarked.
Managed Operating Risk	1	1	1	
Reasonable Workload	1	3	1	
Qualified and Experienced Pilots				
Currency and Proficiency				
Efficiency/Reliability				**Risk to Efficiency/Reliability**
Minimize Delay				N/A
Sufficient Pilot Capacity				
Efficient Movement of Vessels				
Cost	1	3	1	**Risk to Cost**
Reasonable Rates	1	3	1	Setting the standard too low will increase costs. Projected revenues difficult to achieve if standard is too high.
Stable Rates				
Fair Pilot Compensation				
Adequate Cost Recovery				

	Alt 1	Alt 2	Alt 3	Risk Statement
Ratemaking Process	2	2	2	**Risk to the Ratemaking Process**
Stability/Repeatability	0	0	0	Clear and full justification for work standards accounting for reasonable activities to provide pilot services.
Transparency	3	3	3	
Simplicity	-1	-1	-1	
Accounts for Interdependencies	0	0	0	
Promotes Investments	0	0	0	
Overall Assessment	6	10	8	
Comment:				

B.2.1 Use of Historical Average to Project Demand

Four alternatives are provided based on two variations: a three-year sliding window average and a hybrid historical average that allows for projection of future demand.

Alternative 1: Three-year average using last three full known years.

Alternative 2: Three-year average estimating current YTD and the two previous full years.

Alternative 3: Five-year hybrid historical average: last three full known years; estimated current YTD; projecting next year as percentage increase to current year.

Alternative 4: Three-year historical hybrid average using only one last known full year.

TableB-4: Assessment Supporting Section 2.3.1: Applying an Average to Project Demand

	Alt 1	Alt 2	Alt 3	Alt 4	Risk Statement
Safety					**Risk to Safety**
Fatigue Standards					
Managed Operating Risk					
Reasonable Workload					
Qualified and Experienced Pilots					
Currency and Proficiency					
Efficiency/Reliability	-1	-1	1	3	**Risk to Efficiency/Reliability**
Minimize Delay					Under-projection will cause too few pilots and potential delays. Need ability to apply some judgment to account for future demand.
Sufficient Pilot Capacity	-1	-1	1	3	
Efficient Movement of Vessels					
Cost	3	3	7	5	**Risk to Cost**
Reasonable Rates	1	1	1	1	Over-projection may result in more pilots and increase rates.
Stable Rates	1	1	3	1	
Fair Pilot Compensation	1	1	3	3	
Adequate Cost Recovery	0	0	0	0	

	Alt 1	Alt 2	Alt 3	Alt 4	Risk Statement
Ratemaking Process	9	9	7	7	**Risk to the Ratemaking Process**
Stability/Repeatability	3	3	3	3	Performing YTD and projecting next year's increase over current year increase complexity and reduce repeatability.
Transparency	3	3	3	3	
Simplicity	3	3	1	1	
Accounts for Interdependencies	0	0	0	0	
Promotes Investments	0	0	0	0	
Overall Assessment	11	11	13	15	
Comment: Use of most-recent history regarded as best indicator of the future. Applying a YTD estimation to the current year leverages the most up-to-date information. Including a projection for next year in the average based on economic forecast indicators allows for some leading indicator influence on projecting future demand.					

B.2.2 Estimating the Number of Pilots

Alternatives for calculating staffing levels revolve around dividing the projected number of assignments by the expected number of assignments per pilot, where the expected number of assignments is equal to:

Alternative 1: 50% of the maximum number of assignments

Alternative 2: 40% of the maximum number of assignments

Alternative 3: An efficiency factor based on an analysis of previous year's demand

Table B-5: Assessment Supporting Section 2.3.2: Estimating the Number of Pilots

	Alt 1	Alt 2	Alt 3	Risk Statement
Safety	2	4	6	**Risk to Safety**
Fatigue Standards	1	3	3	Sufficient pilots provide for a reasonable workload and avoid fatigue. Too many pilots may result in excess capacity.
Managed Operating Risk				
Reasonable Workload	1	1	3	
Qualified and Experienced Pilots				
Currency and Proficiency				
Efficiency/Reliability				**Risk to Efficiency/Reliability**
Minimize Delay				
Sufficient Pilot Capacity				
Efficient Movement of Vessels				
Cost	2	0	4	**Risk to Cost**
Reasonable Rates	1	-1	3	Personnel costs are largest contributor to overall costs. Too many pilots impact individual wages.
Stable Rates				
Fair Pilot Compensation	1	1	1	
Adequate Cost Recovery				

	Alt 1	Alt 2	Alt 3	Risk Statement
Ratemaking Process	4	4	0	**Risk to the Ratemaking Process**
Stability/Repeatability	1	1	0	
Transparency	1	1	0	
Simplicity	1	1	-3	
Accounts for Interdependencies	1	1	3	
Promotes Investments				
Overall Assessment	8	8	10	
Comment:				

B.3 Billing Scheme

Two different billing scheme standards were identified that link the base rates to the pilotage time required for transit:

Alternative 1: Standard Hourly Transit Times

Alternative 2: Six-Hour-Block Standard Times

Table B-6: Assessment Supporting Section 2.4: Billing Schemes

	Alt 1	Alt 2	Risk Statement
Safety	3	1	**Risk to Safety**
Fatigue Standards			No risk to rush assignments.
Managed Operating Risk	3	1	
Reasonable Workload			
Qualified and Experienced Pilots			
Currency and Proficiency			
Efficiency/Reliability	3	1	**Risk to Efficiency/Reliability**
Minimize Delay			Incentive to keep vessels moving through the system.
Sufficient Pilot Capacity			
Efficient Movement of Vessels	3	1	
Cost	0	0	**Risk to Cost**
Reasonable Rates	0	0	Additional costs for not meeting standards.
Stable Rates			
Fair Pilot Compensation			
Adequate Cost Recovery			

	Alt 1	Alt 2	Risk Statement
Ratemaking Process	-1	-1	**Risk to the Ratemaking Process**
Stability/Repeatability			Transit definitions and standards need to be updated every three to five years.
Transparency			
Simplicity	-1	-1	
Accounts for Interdependencies			
Promotes Investments			
Overall Assessment	5	1	
Comment:			

B.4 Pilot Compensation

Alternatives that establish the base compensation are explored below. All the alternatives include discontinuing the differentiation between undesignated/designated waters and including an escalation value when a published compensation rate is not available.

Alternative 1: Canadian Great Lakes Pilotage Authority Compensation

Alternative 2: Canadian Laurentian Pilotage Authority Compensation

Alternative 3: Federal Pilot Compensation

Alternative 4: Negotiated between pilots and industry

Table B-7: Assessment Supporting Section 2.6: Pilot Compensation

	Alt 1	Alt 2	Alt 3	Alt 4	Risk Statement
Safety	0	1	1	1	**Risk to Safety**
Fatigue Standards					Improvements to qualified, experience, and proficient pilots are only indirectly related to pilot compensation within the current state of the system. These are directly related with closing the revenue gap, which is addressed in other recommendations. Perception of low compensation leads to morale and retention issues.
Managed Operating Risk					
Reasonable Workload					
Qualified and Experienced Pilots	0	1	1	1	
Currency and Proficiency					
Efficiency/Reliability					**Risk to Efficiency/Reliability**
Minimize Delay					
Sufficient Pilot Capacity					
Efficient Movement of Vessels					

	Alt 1	Alt 2	Alt 3	Alt 4	Risk Statement
Cost	3	1	5	11	**Risk to Cost**
Reasonable Rates	3	1	1	5	Pilot compensation is approx. 70% of expenses, causing a direct correlation between compensation and rates.
Stable Rates	-3	-1	3	3	
Fair Pilot Compensation	3	1	1	3	
Adequate Cost Recovery					
Ratemaking Process	-13	5	6	3	**Risk to the Ratemaking Process**
Stability/Repeatability	-5	-3	3	3	Reliance on year-to-year variances based on other external factors (union contracts) and lack of visibility into proprietary information causes concern/anxiety. Current calculations reduce clarity.
Transparency	-3	5	3	3	
Simplicity	-5	3	1	-3	
Accounts for Interdependencies					
Promotes Investments					
Overall Assessment	-10	7	12	15	
Comment:					

APPENDIX C. SUPPORTING INFORMATION AND CALCULATIONS

The Klein system used by the Great Lake Pilotage pilots, both U.S. and Canadian, to track pilot assignments has been used in this report to analyze and assess the characteristics of the Great Lakes pilotage system. The initial years in the Klein system have compliance and data quality issues. The years 2008 through 2011 are the focus of the assessment, as they exhibited general compliance and minimal data quality issues.

C.1 Transit Statistics

To simplify manipulating the data, transit codes were established that group a collection of point-to-point transits in a bi-directional manner (e.g., a transit from Port Colborne to Southeast Shoal is the same transit code as a transit from Southeast Shoal to Port Colborne.). The number of occurrences of each transit and the minimum, maximum, average, and standard deviation for each transit are summarized in **Table C-1: 2011 Transit Statistics** through **Table C-4: 2008 Transit Statistics.** The total for each area provides the average trip time in the area.

Table C-1: 2011 Transit Statistics

Transit Code	Occurrences	Minimum	Maximum	Average	Std. Dev.
Area 1 Totals:	**634**	**0.2**	**35.0**	**7.4**	**3.4**
IRO-CVC	202	3.0	13.3	6.6	1.0
SNL-CVC	226	0.7	35.0	10.8	3.3
SNL-IRO	203	0.8	7.4	4.6	0.9
MVG1	3	0.2	1.7	0.7	0.8
Area 2 Totals:	**500**	**0.1**	**26.0**	**10.0**	**4.3**
CVC-PWL	277	0.1	22.2	11.0	2.1
CVC-WON	118	5.1	26.0	13.6	2.8
PWL-WON	69	1.5	9.7	3.6	1.7
WON	6	3.2	6.5	5.0	1.6
MVG2	30	0.3	4.5	1.7	1.0
Area 4 Totals:	**328**	**0.0**	**25.6**	**10.5**	**4.2**
PCO-ASH	12	7.0	12.2	8.7	1.6
PCO-CLE	57	8.0	18.0	12.5	2.0
PCO-ERI	4	5.5	7.3	6.5	0.8
PCO-SES	191	0.0	25.6	12.3	2.4
SES-ASH	8	5.0	6.9	6.2	0.7
SES-CLE	42	0.0	20.0	4.3	3.7
MVG4	14	1.0	2.2	1.6	0.3

Transit Code	Occurrences	Minimum	Maximum	Average	Std. Dev.
Area 5 Totals:	**601**	**0.0**	**34.0**	**5.7**	**2.7**
DET-B12	34	0.0	29.7	7.3	4.4
DPB-B12	223	0.0	30.8	6.5	2.1
SES-DET	38	2.0	6.9	5.1	0.9
SES-DPB	170	0.0	34.0	5.2	2.5
SES-TOL	36	0.0	26.5	5.5	4.1
TOL-DET	16	3.3	9.7	7.1	1.6
TOL-DPB	41	2.2	9.5	6.0	1.7
MVG5	43	0.0	7.0	1.6	1.2
Area 6 Totals:	**457**	**0.0**	**133.5**	**23.6**	**16.3**
B12-DTR	159	0.0	20.8	14.0	2.9
B12-GBUSO	47	0.0	103.1	32.6	14.0
B12-GDE	12	4.7	22.2	9.2	5.4
B12-LITT	2	24.7	26.5	25.6	1.3
B12-MILW	19	26.5	51.7	36.4	6.0
B12-SLM	91	0.0	133.5	44.3	17.1
DTR	1	5.5	5.5	5.5	N/A
DTR-GBUSO	5	14.8	40.0	24.1	12.0
DTR-LITT	1	29.6	29.6	29.6	N/A
DTR-MILW	12	14.7	30.1	21.1	3.6
DTR-SLM	33	13.3	31.8	26.0	3.0
DTR-TOB	1	11.6	11.6	11.6	N/A
DTR-TVC	3	2.3	8.5	6.2	3.4
GBUSO-SLM	7	20.3	25.6	23.3	2.0
GDE-DTR	1	14.8	14.8	14.8	N/A
GDE-GBUSO	1	34.3	34.3	34.3	N/A
GDE-SLM	4	38.3	42.6	40.2	1.9
MILW-GBUSO	3	19.5	28.3	23.7	4.4
MILW-SLM	20	1.5	21.4	10.9	4.2
SLM	4	3.2	6.0	4.2	1.3
SLM-TVC	2	18.0	23.3	20.6	3.7
TOB-LITT	1	4.9	4.9	4.9	N/A
MVG6	28	0.8	29.1	4.7	6.8
Area 7 Totals:	**223**	**0.0**	**36.1**	**7.3**	**3.6**
B33-DTR	180	0.0	36.1	7.2	3.0
B33-SOO	11	1.5	25.8	6.1	6.9
DTR-SOO	29	3.8	31.2	8.5	4.8
MVG7	3	1.3	3.5	2.6	1.2
Area 8 Totals:	**227**	**0.0**	**93.9**	**16.5**	**10.3**
B33-DUL	124	0.0	93.9	22.5	8.6
B33-TUN	53	0.0	22.6	13.7	4.3
DUL-TUN	8	0.0	24.7	15.1	7.3
MVG8	42	0.9	10.6	2.2	1.4

Table C-2: 2010 Transit Statistics

Transit Code	Occurrences	Minimum	Maximum	Average	Std. Dev.
Area 1 Totals:	**591**	**-1.5**	**15.9**	**7.5**	**2.9**
IRO-CVC	179	3.8	11.8	6.6	1.0
SNL-CVC	229	-1.5	15.9	10.6	1.5
SNL-IRO	180	1.1	6.3	4.5	0.7
MVG1	3	0.5	2.1	1.3	0.8
Area 2 Totals:	**515**	**-19.1**	**44.3**	**9.6**	**5.2**
CVC-OSW	1	4.6	4.6	4.6	n/a
CVC-PWL	294	-16.4	23.0	10.5	2.9
CVC-ROC	1	-19.1	-19.1	-19.1	n/a
CVC-WON	113	6.5	44.3	14.1	4.3
IRO-CVC	2	5.0	17.1	11.0	8.5
OSW-PWL	1	8.8	8.8	8.8	n/a
PWL-WON	75	-7.2	6.3	2.8	1.8
WON	3	4.0	5.0	4.5	0.5
WON-ROC	1	9.5	9.5	9.5	n/a
MVG2	24	-9.4	5.8	0.7	2.9
Area 4 Totals:	**461**	**-0.7**	**62.0**	**11.2**	**6.3**
ERIE	2	7.5	15.5	11.5	5.7
PCO-ASH	12	6.9	12.9	9.4	1.9
PCO-BUF	4	2.7	6.5	4.8	1.6
PCO-CLE	56	9.8	48.5	14.2	6.8
PCO-ERI	8	-0.7	28.9	8.7	8.8
PCO-SES	281	7.9	57.8	12.9	4.1
SES-ASH	9	4.9	7.4	6.0	0.7
SES-BUF	2	12.3	17.9	15.1	4.0
SES-CLE	49	2.3	23.7	4.3	3.9
SES-DET	3	4.8	5.8	5.1	0.5
SES-DPB	1	4.6	4.6	4.6	n/a
SES-ERI	5	8.3	62.0	21.5	22.8
SES-TOL	4	1.3	5.0	2.8	1.6
MVG4	22	0.0	24.8	3.4	6.7

Transit Code	Occurrences	Minimum	Maximum	Average	Std. Dev.
Area 5 Totals:	**821**	**-19.8**	**31.5**	**5.3**	**3.6**
DET-B12	24	4.5	31.5	7.5	5.3
DPB-B12	303	-0.8	29.8	6.7	2.4
DPB-SCR	1	5.0	5.0	5.0	n/a
SCR-B12	1	1.5	1.5	1.5	n/a
SES-CLE	2	3.0	3.1	3.0	0.1
SES-DET	60	2.3	28.3	6.2	3.3
SES-DPB	242	3.5	29.5	5.5	3.2
SES-TOL	42	-18.1	25.8	5.1	6.1
TOL-DET	4	4.4	8.8	6.0	1.9
TOL-DPB	12	3.3	6.3	5.0	0.9
MVG5	119	-3.3	5.8	1.1	1.1
Area 6 Totals:	**548**	**0.3**	**121.3**	**22.1**	**13.8**
B12-BAY	2	22.5	28.8	25.6	4.4
B12-DTR	231	5.6	41.2	14.8	3.9
B12-GBUSO	50	1.7	61.7	26.9	7.2
B12-GDE	17	4.8	54.9	12.1	12.6
B12-LITT	10	14.9	18.5	16.7	1.3
B12-MILW	31	18.6	81.9	38.4	12.3
B12-SLM	79	14.3	121.3	40.0	11.3
DTR-GBUSO	8	13.5	74.3	38.1	25.9
DTR-LITT	10	8.5	13.8	10.9	2.2
DTR-MILW	10	14.3	49.5	23.6	10.0
DTR-SLM	40	9.0	50.1	25.4	5.7
GBUSO-MUS	2	75.7	83.5	79.6	5.5
GBUSO-SLM	3	19.8	37.8	26.6	9.8
GDE-DTR	2	12.3	21.3	16.8	6.4
GDE-SLM	3	36.3	41.5	38.2	2.9
MILW-GBUSO	1	27.5	27.5	27.5	n/a
MILW-SLM	30	5.1	18.8	10.9	2.7
SLM	1	3.7	3.7	3.7	n/a
SLM-MUS	2	35.0	75.3	55.1	28.5
MVG6	15	0.3	3.8	2.2	1.0
Area 7 Totals:	**337**	**-16.1**	**32.5**	**6.9**	**3.6**
B33-DTR	264	-16.1	32.5	7.0	2.9
B33-SOO	18	-4.0	7.9	2.7	2.5
DTR-SOO	45	-0.2	31.6	8.0	4.9
MVG7	10	2.6	27.2	6.1	7.4

Transit Code	Occurrences	Minimum	Maximum	Average	Std. Dev.
Area 8 Totals:	**351**	**0.8**	**170.3**	**19.5**	**17.0**
B33-DUL	178	13.3	170.3	28.5	18.5
B33-TUN	72	8.5	60.2	17.1	6.6
DUL-TUN	15	12.6	18.9	14.7	1.5
MVG8	86	0.8	15.4	3.8	3.9

Table C-3: 2009 Transit Statistics

Transit Code	Occurrences	Minimum	Maximum	Average	Std. Dev.
Area 1 Totals:	**434**	**0.8**	**35.0**	**7.7**	**3.9**
IRO-CVC	134	5.3	26.0	6.8	1.9
SNL-CVC	163	7.3	35.0	11.0	3.8
SNL-IRO	134	0.8	6.3	4.5	0.7
MVG1	3	1.2	26.8	11.1	13.7
Area 2 Totals:	**358**	**-2.8**	**31.0**	**10.1**	**4.1**
CVC-OSW	4	4.3	5.5	4.8	0.5
CVC-PWL	210	-2.8	31.0	11.1	2.4
CVC-WON	78	0.0	19.7	13.2	2.4
PWL-WON	49	0.8	10.5	3.4	1.8
WON	3	5.3	8.3	6.6	1.5
MVG2	14	0.5	7.2	2.8	1.8
Area 4 Totals:	**292**	**0.0**	**37.6**	**10.8**	**4.9**
PCO-ASH	10	7.8	12.8	9.4	1.7
PCO-BUF	2	3.2	4.0	3.6	0.6
PCO-CLE	39	9.3	37.6	13.1	4.4
PCO-ERI	5	4.7	7.9	5.7	1.3
PCO-SES	176	10.0	35.3	12.7	2.7
SES-ASH	5	5.7	6.6	6.2	0.4
SES-BUF	2	31.8	31.8	31.8	0.0
SES-CLE	35	0.0	11.3	3.2	1.6
SES-DET	2	4.4	5.7	5.0	0.9
SES-DPB	2	5.0	5.0	5.0	0.0
SES-ERI	3	9.3	10.0	9.7	0.4
SES-TOL	1	2.7	2.7	2.7	n/a
MVG4	10	1.6	6.0	2.7	1.3

Transit Code	Occurrences	Minimum	Maximum	Average	Std. Dev.
Area 5 Totals:	**468**	**0.2**	**52.8**	**5.7**	**3.3**
DET-B12	20	5.3	9.5	6.7	1.1
DPB-B12	188	5.1	32.3	6.7	2.2
SES-CLE	1	4.8	4.8	4.8	n/a
SES-DET	37	3.8	8.8	5.2	1.0
SES-DPB	155	3.8	52.8	5.5	4.3
SES-TOL	22	0.9	21.2	5.7	3.8
TOL-DET	4	6.3	7.5	7.1	0.6
TOL-DPB	6	3.0	7.3	4.9	1.4
MVG5	32	0.2	3.1	1.2	0.7
Area 6 Totals:	**352**	**-4.3**	**72.5**	**20.6**	**12.8**
B12-BRIT	2	18.3	18.5	18.4	0.2
B12-DTR	149	-0.3	38.3	13.7	3.8
B12-GBUSO	10	24.4	41.8	30.6	5.0
B12-GDE	7	4.8	8.6	6.3	1.3
B12-LITT	11	14.0	15.3	14.6	0.4
B12-LUD	10	44.2	72.5	54.0	8.3
B12-MILW	16	31.3	40.9	35.2	3.1
B12-SAG	2	9.8	10.5	10.2	0.5
B12-SLM	51	16.3	48.8	39.5	5.0
B33-DTR	2	7.2	13.2	10.2	4.2
B33-DUL	1	24.7	24.7	24.7	n/a
DTR-LITT	12	7.8	15.7	11.4	2.4
DTR-LUD	6	19.0	45.5	30.1	8.7
DTR-MILW	10	13.6	21.3	18.6	2.8
DTR-SLM	25	12.3	29.5	23.4	4.3
GBUSO-SLM	2	18.3	28.1	23.2	6.9
GDE-LITT	1	12.7	12.7	12.7	n/a
MILW-GDE	1	44.3	44.3	44.3	n/a
MILW-SLM	20	4.8	23.0	11.0	3.6
SLM	2	-4.3	7.6	1.6	8.4
MILW-GBUSO	1	6.8	6.8	6.8	n/a
MVG6	10	0.8	3.8	2.5	0.9
Area 7 Totals:	**276**	**-243.3**	**29.7**	**3.4**	**16.5**
B33-DTR	221	-243.3	29.7	3.0	18.3
B33-SOO	8	1.9	3.0	2.3	0.4
DTR-SOO	36	-11.2	29.4	6.4	5.1
MVG7	11	0.5	5.8	2.5	1.7

Transit Code	Occurrences	Minimum	Maximum	Average	Std. Dev.
Area 8 Totals:	**229**	**-21.8**	**67.1**	**19.0**	**10.1**
B33-DUL	122	1.6	67.1	24.9	7.9
B33-HOU	4	13.2	14.0	13.6	0.4
B33-TUN	49	3.7	48.9	17.0	6.6
DUL-HOU	6	14.5	17.3	15.0	1.1
DUL-TUN	13	11.7	18.1	13.7	1.6
TUN-HOU	1	13.7	13.7	13.7	n/a
MVG8	34	-21.8	14.1	4.4	6.9

Table C-4: 2008 Transit Statistics

Transit Code	Occurrences	Minimum	Maximum	Average	Std. Dev.
Area 1 Totals:	**632**	**0.0**	**42.0**	**8.0**	**5.2**
IRO-CVC	188	0.0	32.2	6.9	3.0
SNL-CVC	233	2.7	42.0	12.0	5.7
SNL-IRO	190	1.3	28.6	4.7	1.9
MVG1	21	0.3	26.5	4.1	5.7
Area 2 Totals:	**481**	**-0.2**	**33.5**	**10.1**	**4.4**
CVC-PWL	273	7.0	33.5	11.2	2.7
CVC-WON	110	10.0	28.8	13.6	2.3
PWL-WON	82	-0.2	7.9	3.3	1.3
WON	2	3.5	4.0	3.8	0.4
MVG2	14	0.1	2.6	1.5	0.6
Area 4 Totals:	**444**	**0.0**	**36.3**	**10.1**	**4.7**
DPB-B12	1	6.4	6.4	6.4	n/a
PCO-ASH	17	7.9	13.8	9.8	1.5
PCO-BUF	3	2.8	7.5	4.8	2.5
PCO-CLE	67	10.6	26.5	13.6	3.3
PCO-ERI	15	4.3	6.6	5.4	0.8
PCO-SES	240	0.0	36.3	12.2	2.6
SES-ASH	7	4.8	7.0	5.8	0.8
SES-CLE	60	1.9	16.0	3.7	2.1
SES-DPB	2	4.7	4.8	4.7	0.1
SES-ERI	3	9.6	16.2	12.7	3.3
SES-TOL	1	4.2	4.2	4.2	n/a
MVG4	27	0.5	25.8	2.5	4.7

Transit Code	Occurrences	Minimum	Maximum	Average	Std. Dev.
Area 5 Totals:	**616**	**-7.6**	**30.5**	**5.9**	**2.4**
DET-B12	16	-7.6	7.8	5.4	3.5
DPB-B12	257	4.5	30.5	6.6	2.6
PCO-SES	1	11.5	11.5	11.5	n/a
SES-ASH	1	6.3	6.3	6.3	n/a
SES-CLE	1	3.4	3.4	3.4	n/a
SES-DET	44	4.3	15.3	6.1	2.6
SES-DPB	220	2.6	18.8	5.2	1.6
SES-TOL	45	4.1	13.8	6.1	1.9
TOL-DET	2	6.8	10.5	8.7	2.6
TOL-DPB	10	4.5	7.7	5.7	0.9
MVG5	19	0.4	10.8	3.0	3.3
Area 6 Totals:	**424**	**-44.2**	**79.8**	**20.3**	**12.2**
B12-BRIT	4	-44.2	24.0	4.6	32.6
B12-DTR	193	5.3	21.3	14.2	2.6
B12-GBUSO	48	-1.4	36.5	25.1	5.7
B12-GDE	9	4.4	11.9	6.5	2.3
B12-LUD	1	32.8	32.8	32.8	n/a
B12-MILW	21	6.0	38.8	32.9	6.6
B12-SLM	58	28.0	79.8	41.2	8.6
DTR-LUD	1	14.0	14.0	14.0	n/a
DTR-MILW	11	11.8	28.6	19.9	5.6
DTR-SLM	32	17.0	52.9	25.8	6.3
GBUSO-SLM	1	20.3	20.3	20.3	n/a
MILW-SLM	26	7.8	39.3	12.7	7.6
SLM	6	-3.8	11.5	4.4	5.0
MVG6	13	-11.1	46.5	4.4	13.2
Area 7 Totals:	**311**	**-11.3**	**32.3**	**6.8**	**4.5**
B12-DTR	1	0.7	0.7	0.7	n/a
B33-DTR	257	-11.3	31.4	7.0	4.2
B33-SOO	6	0.8	4.3	2.4	1.4
DTR-SOO	42	-6.7	32.3	7.1	5.7
MVG7	4	0.9	1.8	1.4	0.4
Area 8 Totals:	**251**	**-2.0**	**86.0**	**17.9**	**9.5**
B33-DUL	122	14.2	51.8	23.3	5.1
B33-MTN	4	7.3	86.0	32.4	37.1
B33-TUN	87	7.4	32.1	15.9	5.1
DUL-TUN	5	13.6	21.0	16.5	3.8
MVG8	33	-2.0	4.2	1.9	1.2

- **Table C-5: 2011 Delays and Detentions** through **Table C-8: 2008 Delays and Detentions** characterize the delay and detention occurrences for each trip and present the minimum, mean, median, and maximum value for each year and area. The mean and median statistics for the Raw Data include only the non-zero values. The mean and median from the Raw Data set measure the statistics for those cases where a delay or detention occurs; they do not include the cases where there were no delays or detentions. The result is that they measure the statistics over the population of trips where a delay or detention has occurred. The mean and median for the Filtered data are inclusive of all cases. The result is that they measure the statistics over the entire population of the Filtered data set. For District 3, specific travel information for 2008 through 2011 was provided by the WGLPA.
- **Table C-9: 2011 Travel** through **Table C-12: 2008 Travel** characterize the travel duration required for each area's assignments by year. For District 3, validated travel statistics were provided directly from the association. The travel time is measured for the minimum, mean, median, and maximum duration values. The statistics for the Raw Data include only the non-zero values in the mean and median calculation. The mean and median from the Raw Data set measure the statistics for those cases where a travel occurs; they do not include the cases where there was no travel time. The result is that they measure the statistics over the population of assignments where travel has occurred. The mean and median for the Filtered data are inclusive of all cases. The result is that they measure the statistics over the entire population of the Filtered data set.

Table C-5: 2011 Delays and Detentions

		From Raw Data					Filtered Data				
		# Trips	Min	Mean	Median	Max	# Trips	Min	Mean	Median	Max
D1	Area 1	632	0	0.6	0	28.3	632	0	0.5	0	15.5
	Area 2	470	0	0.9	0	38.7	470	0	0.7	0	15.5
	Area 3	*Welland Canal Exclusive to Canadian Pilots*									
D2	Area 4	312	0	0.7	0	39.3	312	0	0.6	0	15
	Area 5	551	0	0.4	0	21.4	551	0	0.3	0	10.3
D3	Area 6	426	0	1	0	80.8	426	0	0.7	0	19.4
	Area 7	219	0	0.5	0	23	219	0	0.2	0	9.8
	Area 8	183	0	4.7	6.3	15.2	183	0	4.4	6.3	11.2

Table C-6: 2010 Delays and Detentions

		From Raw Data					Filtered Data				
		# Trips	Min	Mean	Median	Max	# Trips	Min	Mean	Median	Max
D1	Area 1	588	0	0.7	0	17	588	0	0.5	0	13.3
	Area 2	486	0	0.9	0	30.7	478	0	0	0.8	11.7
	Area 3	*Welland Canal Exclusive to Canadian Pilots*									
D2	Area 4	437	0	0.5	0	16.3	430	0	0.4	0	7
	Area 5	694	0	0.5	0	24.7	678	0	0.5	0	16
D3	Area 6	533	0	1	0	109.7	522	0	0.6	0	20.4
	Area 7	330	0	0.2	0	21.1	325	0	0.1	0	13.1
	Area 8	275	0	2.6	0	61.2	271	0	2.1	0	20.3

Table C-7: 2009 Delays and Detentions

		From Raw Data					Filtered Data				
		# Trips	Min	Mean	Median	Max	# Trips	Min	Mean	Median	Max
D1	Area 1	433	0	0.4	0	42.2	425	0	0.3	0	12.1
	Area 2	343	0	0.8	0	8.3	337	0	0.7	0	5.5
	Area 3	*Welland Canal Exclusive to Canadian Pilots*									
D2	Area 4	283	0	0.6	0	15	278	0	0.4	0	6.2
	Area 5	437	0	0.4	0	16.8	430	0	0.3	0	10.7
D3	Area 6	339	0	1	0	16.5	337	0	1	0	11.9
	Area 7	236	0	0.1	0	8.1	233	0	0.1	0	3.6
	Area 8	206	0	2.4	0	25.8	201	0	2.1	0	10.4

Table C-8: 2008 Delays and Detentions

		From Raw Data					Filtered Data				
		# Trips	Min	Mean	Median	Max	# Trips	Min	Mean	Median	Max
D1	Area 1	627	0	1.2	0	90.1	610	0	0.8	0	33.7
	Area 2	466	0	1	0	22.8	455	0	0.8	0	9.5
	Area 3	*Welland Canal Exclusive to Canadian Pilots*									
D2	Area 4	416	0	0.8	0	28.5	411	0	0.6	0	10.1
	Area 5	597	0	0.4	0	22.8	585	0	0.4	0	10.4
D3	Area 6	408	0	0.8	0	20.4	405	0	0.7	0	13
	Area 7	300	0	0.3	0	17.5	289	0	0.3	0	13
	Area 8	218	0	3.3	0	16.7	216	0	3.2	0	11.7

Table C-9: 2011 Travel

		From Raw Data					Filtered Data				
		# Trips	Min	Mean	Median	Max	# Trips	Min	Mean	Median	Max
D1	Area 1	632	0	2.6	2.3	7.5	632	0	2.4	2.3	5.1
	Area 2	470	0	3.9	5	14.5	470	0	3.9	5	11
	Area 3	*Welland Canal Exclusive to Canadian Pilots*									
D2	Area 4	312	0	3.7	4.5	12	312	0	6.1	4.5	8
	Area 5	551	0	1.9	1.5	8	551	0	3.7	1.5	7
D3	Area 6	426	0	1.9	0	13.5	426	0	1.9	0	13.5
	Area 7	219	0	1.4	1.4	1.4	219	0	1.4	1.4	1.4
	Area 8	183	0	1.7	0	13.5	183	0	1.2	0	9.5

Table C-10: 2010 Travel

		From Raw Data					Filtered Data				
		# Trips	Min	Mean	Median	Max	# Trips	Min	Mean	Median	Max
D1	Area 1	588	0	3	2.3	175	588	0	2.7	2.3	8
	Area 2	486	0	3.4	4.5	14	478	0	3.4	4.5	14
	Area 3	*Welland Canal Exclusive to Canadian Pilots*									
D2	Area 4	437	0	1.5	0	8	430	0	2	0	8
	Area 5	694	0	0.8	0	11	678	0	0.9	0	8
D3	Area 6	533	0	1.7	0	15.5	522	0	1.7	0	15.5
	Area 7	330	0	0.9	0.9	0.9	325	0	0.9	0.9	0.9
	Area 8	275	0	2	0	16	271	0	2	0	16

Table C-11: 2009 Travel

		From Raw Data					Filtered Data				
		# Trips	Min	Mean	Median	Max	# Trips	Min	Mean	Median	Max
D1	Area 1	433	0	2.9	2.5	9	425	0	2.8	2.5	5.8
	Area 2	343	0	4.4	5	13	337	0	4.4	5	13
	Area 3	*Welland Canal Exclusive to Canadian Pilots*									
D2	Area 4	283	0	1.8	0	12.5	278	0	2.7	0	7.1
	Area 5	437	0	1	0	16	430	0	1.4	0	7
D3	Area 6	339	0	2.5	0	16.5	337	0	2.5	0	15.5
	Area 7	236	0	1.6	1.6	1.6	233	0	1.6	1.6	1.6
	Area 8	206	0	1.6	0	16	201	0	1.6	0	16

Table C-12: 2008 Travel

		From Raw Data					Filtered Data				
		# Trips	Min	Mean	Median	Max	# Trips	Min	Mean	Median	Max
D1	Area 1	627	0	3.1	2.5	22.5	610	0	3.1	2.5	8.8
	Area 2	466	0	4.1	4.8	14.5	455	0	4	4.8	13
	Area 3	*Welland Canal Exclusive to Canadian Pilots*									
D2	Area 4	416	0	3.3	3.8	30	411	0	5.6	3.8	12
	Area 5	597	0	2.1	1.5	15.8	585	0	4	1.5	8.2
D3	Area 6	408	0	1.7	0	15.5	405	0	1.7	0	15.5
	Area 7	300	0	1.4	1.4	1.4	289	0	1.4	1.4	1.4
	Area 8	218	0	1.9	0	15.5	216	0	1.9	0	15.5

C.3 Daily Pilot Capacity

The flow of vessel traffic affects the pilotage work level. Vessels arrive at different times throughout the year. The number of pilots available on the Tour de Role constrains the ability of an area to meet the needs of the arriving vessels. For 2011 the daily number of pilot assignments (does not include movages) is plotted against the number of pilots on the Tour de Role and is illustrated in **Figure C-1: 2011 District 1 Daily Pilot Assignments** through **Figure C-3: 2011 District 3 Daily Pilot Assignments.** The number of pilot assignments is indicated along the y-axis; the specific day is indicated along the x-axis. If the assignment spans two days, the assignment will be counted in both days. This visualization provides a pictorial of the daily demand for pilots and points out potential occurrences of where pilots were recalled on short rest or from scheduled time off (brown line). It points out potential occurrences of where pilot capacity was exceeded (red line). A closer look at those specific points revealed there were no delays imposed and that scheduling multiple assignments for one pilot during that day caused the number of assignments in that day to exceed the number of pilots available. Additional Pilot Assignment Cycle data in the Klein system (e.g., mandatory rest, scheduled days off) would provide more insight on how often demand exceeds the number of pilots on the Tour de Role.

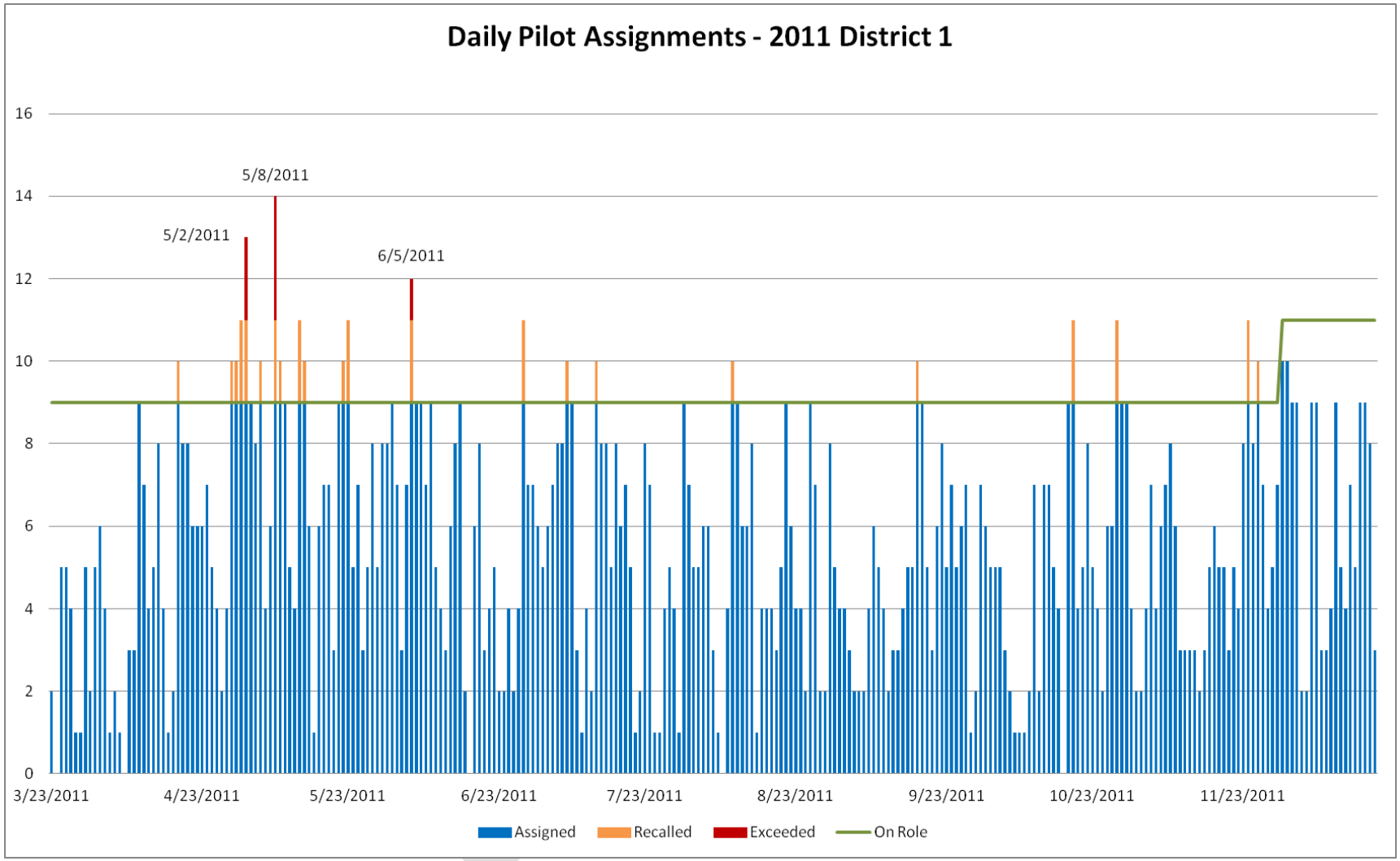

Figure C-1: 2011 District 1 Daily Pilot Assignments

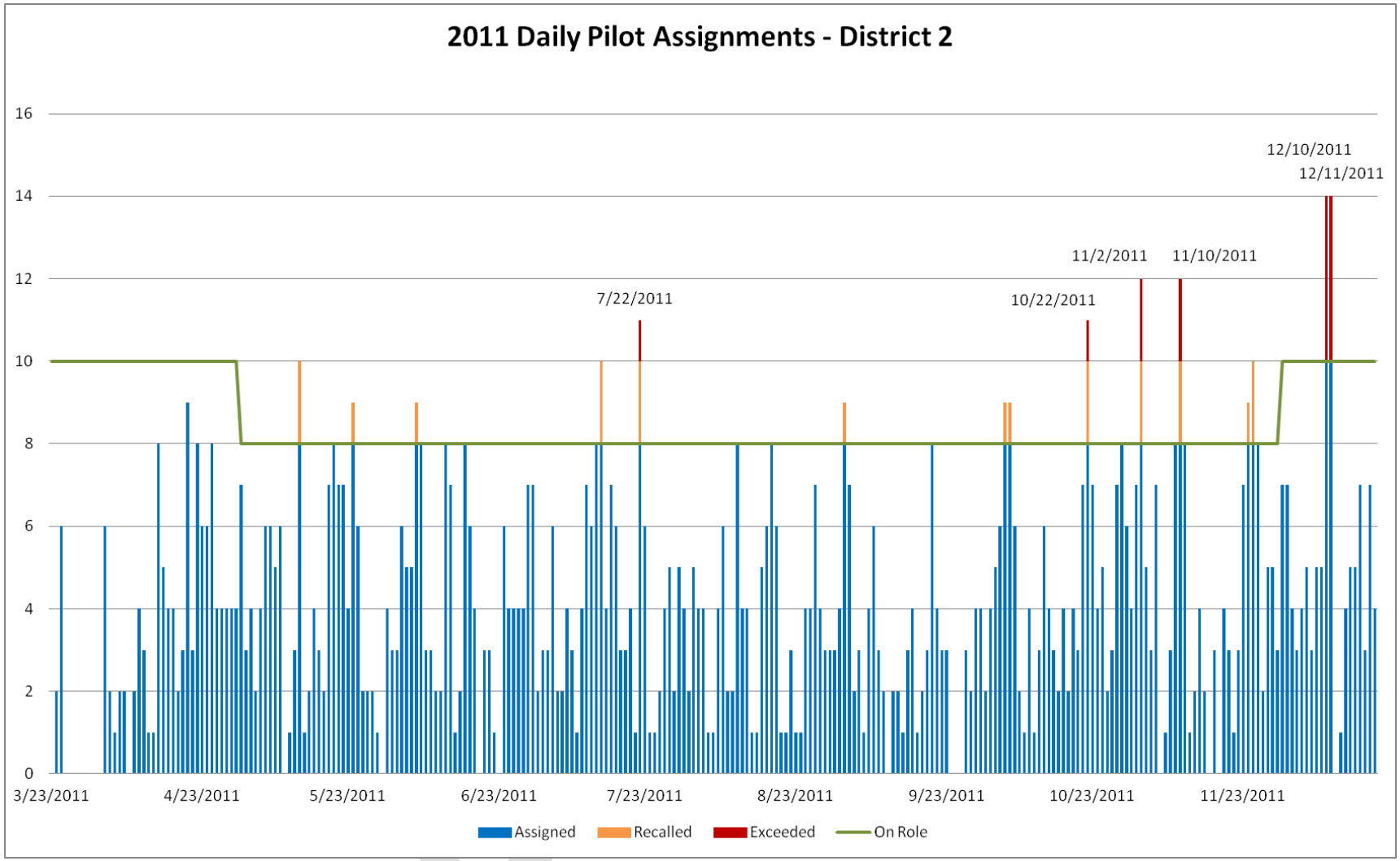

Figure C-2: 2011 District 2 Daily Pilot Assignments

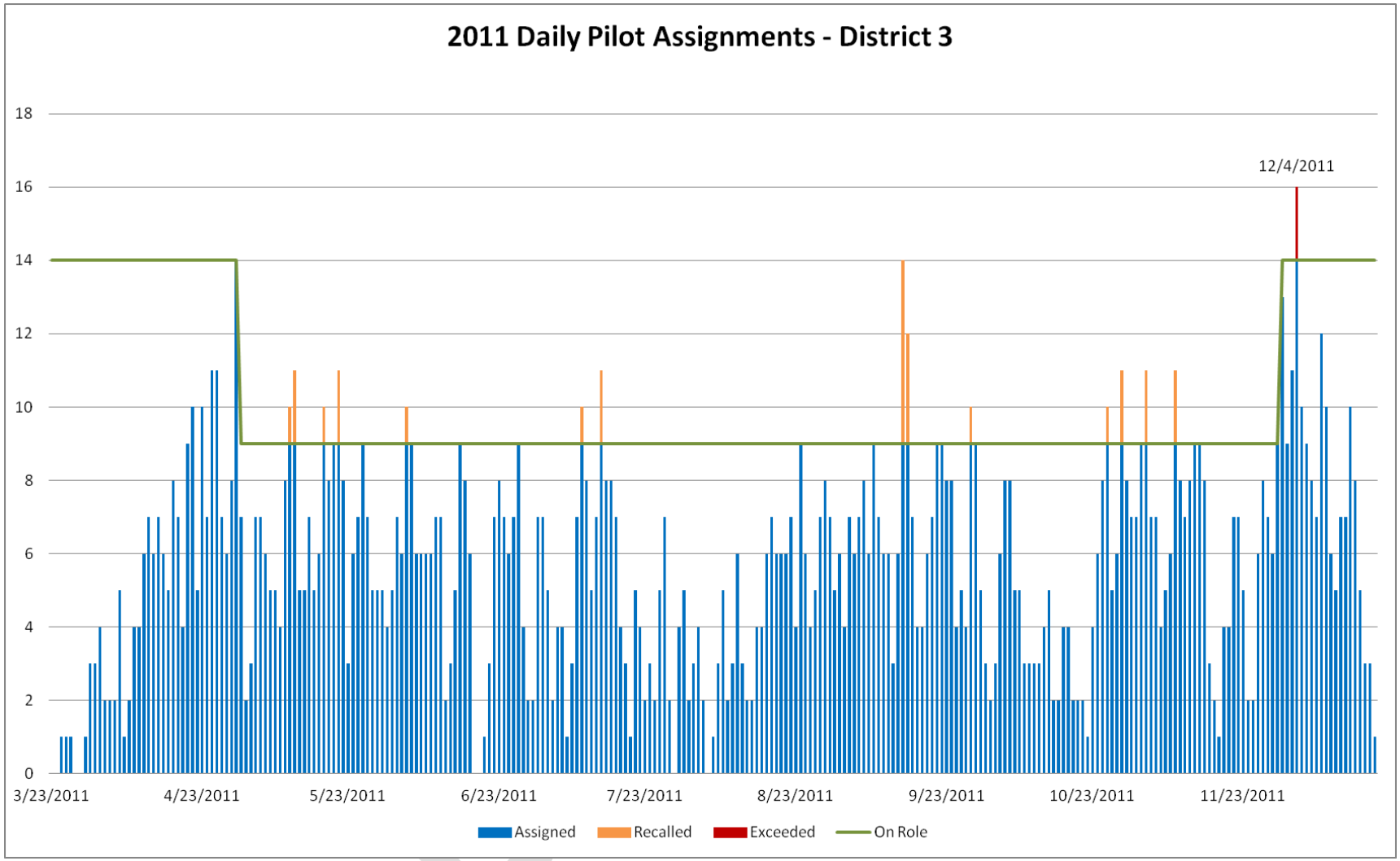

Figure C-3: 2011 District 3 Daily Pilot Assignments

C.4 Pilot Trip Statistics

The pilot work statistics are displayed in **Table C-13: 2011 Pilot Work Statistics** through **Table C-16: 2008 Pilot Work Statistics.** This information is presented annually by area and counts the number of trips and movages conducted by pilot. The bridge time is presented in two different values: the bridge hours with delays, detentions, and cancelations (DDC) included; and the Trip Time where the DDC time has been removed.

Table C-13: 2011 Pilot Work Statistics

Area	Pilot	2011 Trips	2011 Movage	2011 Bridge Hours w/ DDC	2011 Trip Time (hrs)
1	Pilot 1A	108		873	790
	Pilot 1B	91	1	729	695
	Pilot 1C	109		890	828
	Pilot 1D	105		801	765
	Pilot 1E	111		899	828
	Pilot 1F	108	1	854	793
Total for Area 1		**632**	**2**	**5,045**	**4,698**
2	Pilot 1A	1		16	15
	Pilot 1G	22		262	252
	Pilot 1H	114	8	1,250	1,160
	Pilot 1C	2		26	26
	Pilot 1I	113	8	1,234	1,172
	Pilot 1J	112	10	1,323	1,195
	Pilot 1K	106	4	1,266	1,157
Total for Area 2		**470**	**30**	**5,376**	**4,977**
4	Pilot 2A	31		395	385
	Pilot 2B	31		379	379
	Pilot 2C	9		111	102
	Pilot 2D	18		215	207
	Pilot 2E	34		468	418
	Pilot 2F	55	5	606	564
	Pilot 2G	25		318	318
	Pilot 2H	22		253	253
	Pilot 2I	43	1	421	366
	Pilot 2J	44	8	538	449
Total for Area 4		**312**	**14**	**3,704**	**3,441**

Area	Pilot	2011 Trips	2011 Movage	2011 Bridge Hours w/ DDC	2011 Trip Time (hrs)
5	Pilot 2A	64	4	423	408
	Pilot 2B	67	4	402	397
	Pilot 2C	52	8	414	351
	Pilot 2D	74	2	461	451
	Pilot 2E	77	7	499	446
	Pilot 2F	32	8	259	184
	Pilot 2G	69	1	439	430
	Pilot 2H	73	4	532	511
	Pilot 2I	23	2	144	127
	Pilot 2J	20	1	123	98
Total for Area 5		**551**	**41**	**3,696**	**3,403**
6	Pilot 3A	36		932	841
	Pilot 3B	18	1	485	472
	Pilot 3C	46	5	1,351	1,317
	Pilot 3D	16	1	331	324
	Pilot 3E	16		391	352
	Pilot 3F	47	2	1,032	1,018
	Pilot 3G	38	2	1,160	1,053
	Pilot 3H	39	4	1,008	972
	Pilot 3I	34	2	769	744
	Pilot 3J	42	5	1,298	1,232
	Pilot 3K	40		1,099	1,058
	Pilot 3L	10		212	212
	Pilot 3M	42	6	1,206	1,189
	Pilot 3N	2		27	27
Total for Area 6		**426**	**28**	**11,302**	**10,813**
7	Pilot 3B	41		296	278
	Pilot 3C	6		30	30
	Pilot 3D	50	2	376	368
	Pilot 3E	44	1	369	357
	Pilot 3F	2		7	7
	Pilot 3G	2		13	13
	Pilot 3H	4		29	29
	Pilot 3K	20		159	159
	Pilot 3L	49		400	374
	Pilot 3N	1		6	6
Total for Area 7		**219**	**3**	**1,685**	**1,620**

Area	Pilot	2011 Trips	2011 Movage	2011 Bridge Hours w/ DDC	2011 Trip Time (hrs)
8	Pilot 3A	25	4	631	570
	Pilot 3B	6	1	157	136
	Pilot 3C	15	2	364	293
	Pilot 3D	4		71	64
	Pilot 3F	15	2	355	269
	Pilot 3G	17	2	430	339
	Pilot 3H	21	1	542	430
	Pilot 3I	22	6	557	438
	Pilot 3J	15	1	394	297
	Pilot 3K	15	2	371	304
	Pilot 3L	8		210	202
	Pilot 3M	16	4	390	275
	Pilot 3N	4	17	154	140
Total for Area 8		**183**	**42**	**4,627**	**3,757**
Grand Total		**2793**	**160**	**35,435**	**32,708**

Table C-14: 2010 Pilot Work Statistics

Area	Pilot	2010 Trips	2010 Movage	2010 Bridge Hours w DDC	2010 Trip Time (hrs)
1	Pilot 1A	95		777	707
	Pilot 1B	97	1	836	763
	Pilot 1C	101	1	856	780
	Pilot 1D	94		753	701
	Pilot 1E	101		775	738
	Pilot 1F	100		832	751
Total for Area 1		**588**	**2**	**4,828**	**4,441**
2	Pilot 1A	13		175	148
	Pilot 1H	119	2	1,387	1,128
	Pilot 1L	126	9	1,443	1,338
	Pilot 1M	4		41	32
	Pilot 1B	13		145	136
	Pilot 1C	14	1	155	153
	Pilot 1D	13		133	130
	Pilot 1I	116	4	1,326	1,229
	Pilot 1J	44	4	514	471
	Pilot 1E	13		157	147
	Pilot 1F	11		113	113
Total for Area 2		**486**	**20**	**5,590**	**5,024**

Area	Pilot	2010 Trips	2010 Movage	2010 Bridge Hours w DDC	2010 Trip Time (hrs)
4	Pilot 2A	52		673	653
	Pilot 2B	49	4	638	616
	Pilot 2C	21	2	275	261
	Pilot 2D	30		411	408
	Pilot 2E	35		478	468
	Pilot 2F	58	4	695	626
	Pilot 2G	31		382	382
	Pilot 2H	38	1	484	468
	Pilot 2I	60	8	814	718
	Pilot 2J	63	5	709	571
Total for Area 4		**437**	**24**	**5,558**	**5,172**
5	Pilot 2A	84	11	651	582
	Pilot 2B	82	12	597	511
	Pilot 2C	68	20	584	481
	Pilot 2D	89	5	580	541
	Pilot 2E	88	13	597	545
	Pilot 2F	41	7	335	253
	Pilot 2G	88	22	707	563
	Pilot 2H	85	23	691	546
	Pilot 2I	37	6	279	212
	Pilot 2J	32	3	189	165
Total for Area 5		**694**	**122**	**5,210**	**4,399**
6	Pilot 3A	40		1,099	1,054
	Pilot 3I	8		175	169
	Pilot 3B	34	1	828	821
	Pilot 3C	54	1	1,290	1,260
	Pilot 3D	23		438	438
	Pilot 3E	41	5	965	963
	Pilot 3F	52		1,120	1,113
	Pilot 3G	30	1	680	676
	Pilot 3H	56	4	1,483	1,436
	Pilot 3I	15		572	560
	Pilot 3J	61		1,535	1,299
	Pilot 3K	27		457	414
	Pilot 3L	41	3	837	798
	Pilot 3M	42	1	938	899
	Pilot 3N	9		198	198
Total for Area 6		**533**	**16**	**12,615**	**12,099**

Area	Pilot	2010 Trips	2010 Movage	2010 Bridge Hours w DDC	2010 Trip Time (hrs)
7	Pilot 3A	6		34	34
	Pilot 3I	2		16	16
	Pilot 3B	53		368	353
	Pilot 3C	11		60	59
	Pilot 3D	61		469	465
	Pilot 3E	40		348	340
	Pilot 3F	16		112	112
	Pilot 3G	4		27	27
	Pilot 3H	3		20	20
	Pilot 3I	4		25	25
	Pilot 3J	10		72	72
	Pilot 3K	60	1	404	402
	Pilot 3L	48		384	352
	Pilot 3M	8		50	48
	Pilot 3N	4		32	32
Total for Area 7		**330**	**1**	**2,422**	**2,358**
8	Pilot 3A	20	8	547	492
	Pilot 3I	6		185	136
	Pilot 3B	10		409	392
	Pilot 3C	23	4	466	419
	Pilot 3D	15	3	482	414
	Pilot 3E	10	1	247	236
	Pilot 3F	40	3	866	812
	Pilot 3G	16	5	363	321
	Pilot 3H	19	2	553	439
	Pilot 3I	15		499	463
	Pilot 3J	25	1	631	561
	Pilot 3K	18	3	499	484
	Pilot 3L	7	1	234	209
	Pilot 3M	35	6	1,021	928
	Pilot 3N	16	40	595	574
Total for Area 8		**275**	**77**	**7,596**	**6,879**
Grand Total		**3343**	**262**	**43,819**	**40,372**

Table C-15: 2009 Pilot Work Statistics

Area	Pilot	2009 Trips	2009 Movage	2009 Bridge Hours w DDC	2009 Trip Time (hrs)
1	Pilot 1A	73		534	517
	Pilot 1B	68		606	586
	Pilot 1C	79		558	542
	Pilot 1D	65		564	541
	Pilot 1E	75	1	634	609
	Pilot 1F	73		615	546
Total for Area 1		**433**	**1**	**3,511**	**3,341**
2	Pilot 1H	80	2	846	794
	Pilot 1L	80	2	928	854
	Pilot 1M	81	4	953	868
	Pilot 1N	31	1	337	316
	Pilot 1I	70	5	836	779
	Pilot 1F	1		14	10
Total for Area 2		**343**	**14**	**3,914**	**3,621**
4	Pilot 2A	29		380	363
	Pilot 2B	30		361	361
	Pilot 2C	5	1	74	71
	Pilot 2D	18	1	254	236
	Pilot 2E	33	1	477	440
	Pilot 2F	35	1	372	331
	Pilot 2G	24		296	293
	Pilot 2H	27		339	337
	Pilot 2I	39	3	375	341
	Pilot 2J	42	3	472	394
	Pilot 1N	1		22	22
Total for Area 4		**283**	**10**	**3,420**	**3,187**
5	Pilot 2A	59	2	385	365
	Pilot 2B	51	7	382	347
	Pilot 2C	35	3	266	233
	Pilot 2D	57		352	346
	Pilot 2E	61	7	437	348
	Pilot 2F	21	4	148	111
	Pilot 2G	57	3	363	345
	Pilot 2H	55	3	416	378
	Pilot 2I	21	4	150	115
	Pilot 2J	20		107	104
Total for Area 5		**437**	**33**	**3,004**	**2,691**

Area	Pilot	2009 Trips	2009 Movage	2009 Bridge Hours w DDC	2009 Trip Time (hrs)
6	Pilot 3A	36		724	640
	Pilot 3B	6		90	90
	Pilot 3C	36	3	817	774
	Pilot 3O	45	1	998	973
	Pilot 3D	9		209	199
	Pilot 3E	10		214	214
	Pilot 3F	38	1	755	733
	Pilot 3G	37		809	803
	Pilot 3H	39	2	1,111	1,064
	Pilot 3I	4		58	58
	Pilot 3J	30	2	706	646
	Pilot 3K	4		95	95
	Pilot 3P	12		297	277
	Pilot 3L	2		22	22
	Pilot 3M	31	2	688	656
Total for Area 6		**339**	**11**	**7,593**	**7,244**
7	Pilot 3A	5		28	28
	Pilot 3I	1		7	7
	Pilot 3B	41	1	267	267
	Pilot 3C	10		49	49
	Pilot 3O	9		43	43
	Pilot 3D	36	1	260	258
	Pilot 3E	37		274	274
	Pilot 3F	5		14	14
	Pilot 3G	3		19	19
	Pilot 3H	3		44	44
	Pilot 3I	2		12	12
	Pilot 3J	2		13	13
	Pilot 3K	39		265	259
	Pilot 3P	4		27	23
	Pilot 3L	38	3	264	256
	Pilot 3M	1		7	7
Total for Area 7		**236**	**5**	**1,594**	**1,574**

Area	Pilot	2009 Trips	2009 Movage	2009 Bridge Hours w DDC	2009 Trip Time (hrs)
8	Pilot 3A	27		725	667
	Pilot 3I	5		170	170
	Pilot 3B	2	1	41	40
	Pilot 3C	25	2	537	500
	Pilot 3O	26	1	523	482
	Pilot 3E	1		4	4
	Pilot 3F	24		474	442
	Pilot 3G	20	1	489	387
	Pilot 3H	16		361	294
	Pilot 3I	6		160	159
	Pilot 3J	26	3	625	562
	Pilot 3K	1		24	24
	Pilot 3P	5	1	122	115
	Pilot 3L	16	3	465	379
	Pilot 3M	6	12	186	186
Total for Area 8		**206**	**24**	**4,906**	**4,410**
Grand Total		**2,277**	**98**	**27,943**	**26,068**

Table C-16: 2008 Pilot Work Statistics

Area	Pilot	2008 Trips	2008 Movage	2008 Bridge Hours w DDC	2008 Trip Time (hrs)
1	Pilot 1A	107		1,037	854
	Pilot 1B	101	3	1,002	853
	Pilot 1C	109	1	879	816
	Pilot 1D	102		1,071	885
	Pilot 1E	106		949	863
	Pilot 1F	102	1	892	783
Total for Area 1		**627**	**5**	**5,829**	**5,054**
2	Pilot 1H	95	3	1,122	1,005
	Pilot 1L	90	1	1,024	950
	Pilot 1M	92	4	1,044	936
	Pilot 1N	95	3	1,036	951
	Pilot 1I	93	3	1,086	1,005
	Pilot 1E	1		8	5
Total for Area 2		**466**	**14**	**5,321**	**4,853**

Area	Pilot	2008 Trips	2008 Movage	2008 Bridge Hours w DDC	2008 Trip Time (hrs)
4	Pilot 2A	40		488	458
	Pilot 2B	32		387	379
	Pilot 2C	17	2	209	190
	Pilot 2D	32	1	384	372
	Pilot 2E	36	5	451	439
	Pilot 2F	62	11	667	586
	Pilot 2G	41		465	456
	Pilot 2H	38		451	439
	Pilot 2I	59	6	676	607
	Pilot 2J	59	3	666	562
Total for Area 4		**416**	**28**	**4,844**	**4,488**
5	Pilot 2A	75	4	523	509
	Pilot 2B	69	3	451	412
	Pilot 2C	56	4	435	376
	Pilot 2D	75		519	482
	Pilot 2E	69	2	424	405
	Pilot 2F	36	1	235	206
	Pilot 2G	71	3	431	405
	Pilot 2H	83		521	499
	Pilot 2I	34	1	232	189
	Pilot 2J	29		177	157
Total for Area 5		**597**	**18**	**3,948**	**3,640**
6	Pilot 3A	37	3	855	794
	Pilot 3I	9		187	187
	Pilot 3C	37	1	868	846
	Pilot 3O	41	2	877	862
	Pilot 3D	5	1	122	122
	Pilot 3E	5		81	78
	Pilot 3F	38		847	825
	Pilot 3Q	6		89	83
	Pilot 3G	37	2	845	830
	Pilot 3H	38		912	885
	Pilot 3I	14		315	307
	Pilot 3R	19	1	387	353
	Pilot 3J	39	1	847	777
	Pilot 3K	8		140	140
	Pilot 3P	34		833	811
	Pilot 3L	7		155	155
	Pilot 3M	34	1	659	625
Total for Area 6		**408**	**12**	**9,017**	**8,679**

Area	Pilot	2008 Trips	2008 Movage	2008 Bridge Hours w DDC	2008 Trip Time (hrs)
7	Pilot 3A	6		37	34
	Pilot 3B	58		421	418
	Pilot 3C	3		47	35
	Pilot 3O	6		46	41
	Pilot 3D	50		388	384
	Pilot 3E	47		373	358
	Pilot 3F	3	1	17	16
	Pilot 3Q	4		29	29
	Pilot 3G	4		46	28
	Pilot 3H	2		14	14
	Pilot 3I	3		23	19
	Pilot 3R	4		29	29
	Pilot 3J	4	1	22	17
	Pilot 3K	54	1	402	385
	Pilot 3P	2		26	19
	Pilot 3L	48		335	327
	Pilot 3M	2		13	13
Total for Area 7		**300**	**3**	**2,268**	**2,165**
8	Pilot 3A	24	2	580	518
	Pilot 3I	8		191	155
	Pilot 3B	2		39	39
	Pilot 3C	13		254	227
	Pilot 3O	19	2	447	396
	Pilot 3D	5	1	141	129
	Pilot 3E	2		77	61
	Pilot 3F	15		334	271
	Pilot 3Q	7	1	264	257
	Pilot 3G	15		322	247
	Pilot 3H	18	1	399	329
	Pilot 3I	9		208	184
	Pilot 3R	17	2	409	374
	Pilot 3J	23	4	538	432
	Pilot 3K	2		40	40
	Pilot 3P	13	1	287	251
	Pilot 3M	22	1	536	451
	Pilot 3N	4	16	155	139
Total for Area 8		**218**	**31**	**5,221**	**4,499**
Grand Total		**3032**	**111**	**36,448**	**33,378**

APPENDIX D. PILOTAGE SERVICES COMPARISON

The data presented below in **Table D-1: Pilotage Organization Comparison** is a summary of the different pilotage organizations presented in the Dibner report, *Review and Analysis of Harbor Pilot Net Incomes*, of February 8, 2012. The Columbia River Pilots information has been added to the bottom of the table from the Oregon Board of Maritime Pilots final ruling from January 2010. The **Pilot Net Salary** value presented in the table is similar to the salary paid to an employee where the employer pays the payroll taxes; premiums for health, disability, dental, and life insurance; and contributions to retirement programs.

No correlation between **Pilot Net Salary** and these factors was found:

- **Length of Season**
- **Cargo Value**
- **Size of Vessel**
- **Size of Pilotage Organization**
- **Cargo Value**, **Shipping Weight**, and **Value per Kilogram** from **Table D-2: U.S. Exports – Domestic and Foreign Merchandise** and **Table D-3: U.S. General Imports**

Table D-1: Pilotage Organization Comparison

Pilot Organization	Type of Geography	Type of Cargo	Length of Jurisdiction (miles)	Number of Vessels	Total Tonnage (million)	Total Revenue ($ millions)	Number of Pilots	Number of Apprentice Pilots	Pilot Net Salary	Base Year for Data
Sabine Pilots	Port areas of Port Arthur, Beaumont, and Orange, TX	Crude oil, petroleum products, chemicals, general cargo, and liquefied natural gas	N/A	1,825	57.7	$24.33	29	N/A	$544,838	2009 for traffic volumes; 2012 estimated for cost & revenue
Houston Pilots	Houston Shipping Channel	Crude oil, petroleum products, chemical, liquefied petroleum gas (LPG), dry bulk, and container	N/A	5,908	156.0	$90,611	85	5	$672,164	2009 for traffic volumes; 2012 estimated for cost & revenue
Galveston-Texas City Pilots	All ports and terminals in the Galveston and Texas City area	Crude oil, petroleum products, chemicals, LPG, passengers, dry bulk, container, roll-on/roll-off, and car/truck carriers	N/A	2,829	57.1	$10.45	14	3	$306,621	2009 for traffic volumes; 2012 estimated for cost & revenue

Pilot Organization	Type of Geography	Type of Cargo	Length of Jurisdiction (miles)	Number of Vessels	Total Tonnage (million)	Total Revenue ($ millions)	Number of Pilots	Number of Apprentice Pilots	Pilot Net Salary	Base Year for Data
Brazos Pilots	Port of Freeport in Brazoria County, TX	Crude oil, petroleum products, LPG, dry bulk, and multipurpose container/cargo	N/A	N/A	N/A	N/A	3	1	$510,377	2012 estimated from 2010 base
Aransas–Corpus Christi Pilots	Ports of Corpus Christi, La Quinta, and Ingleside	Crude oil, petroleum products, chemicals, and combination ore/oil/bulk	32 nm	1,229	42.0	N/A	13	N/A	$456,677	2009 for traffic volumes; 2012 estimated for cost & revenue
Crescent River Port Pilots	Mississippi River from Pilottown to Port of New Orleans	N/A	103	N/A	N/A	N/A	106	N/A	$406,832	2012 target compensation from 2009 negotiated agreement
New Orleans–Baton Rouge Steamship Pilots Association of New Orleans	Between New Orleans and Baton Rouge	Crude oil, petroleum products, dry bulk, container, roll-on/roll-off, and car/truck	137	N/A	N/A	N/A	100	N/A	$437,772	Estimated 2012 target from 2010 financial statements
Associated Branch Pilots of the Port of New Orleans	Mississippi River between Pilottown and the Gulf of Mexico	N/A	24	N/A	N/A	N/A	N/A	N/A	$400,372	Estimated 2012 target from 2011 filing

Pilot Organization	Type of Geography	Type of Cargo	Length of Jurisdiction (miles)	Number of Vessels	Total Tonnage (million)	Total Revenue ($ millions)	Number of Pilots	Number of Apprentice Pilots	Pilot Net Salary	Base Year for Data
Lake Charles Pilots	Calcasieu River and the Port of Lake Charles	N/A	67	N/A	N/A	N/A	N/A	N/A	$368,536	Estimated 2012 target from 2011 filing
Pascagoula Pilots	Port of Pascagoula	Crude oil, petroleum products, chemicals, ore/ oil/bulk, and liquefied natural gas	N/A	695+161	21.9 + US export volume	$3.66	7	N/A	$339,866	2009 for traffic volumes; 2012 estimate for cost & revenue
Mobile Bay and Bar Pilots	Ports of Mobile and Theodore	Coal, rail car ferry, unfinished steel, and chemicals	N/A	N/A	N/A	$7.04	12	N/A	$335,744	Estimated 2012 from 2009 traffic base
St. Johns Bar Pilots	St Johns River, including Mayport and Jacksonville	N/A	N/A	N/A	42.9	$9.33	12	N/A	$371,692	Total tonnage from 2010; pilot numbers from 2007; revenue estimated for 2011; compensation estimated for 2012

Pilot Organization	Type of Geography	Type of Cargo	Length of Jurisdiction (miles)	Number of Vessels	Total Tonnage (million)	Total Revenue ($ millions)	Number of Pilots	Number of Apprentice Pilots	Pilot Net Salary	Base Year for Data
Port Everglades	Port Everglades and Dania	Cruise ships, petroleum products, dry bulk, container, roll-on/ roll-off, and LPG barges	N/A	3,803	92.1	$10.65	19	N/A	$300,439	2009 traffic volumes; pilot numbers and revenue estimated for 2012
Biscayne Pilots	Port of Miami	Cruise ships container, roll-on/ roll-off, and multipurpose cargo	N/A	N/A	81.8	$10.62	17	N/A	$352,319	2009 traffic volumes; estimated revenue for 2010; pilot numbers and compensation estimated for 2011
Tampa Bay Pilots	Ports of Tampa, Manatee, and St. Petersburg	Petroleum products, LPG and ammonia, dry bulk, and cruise ships	N/A	1,089	30.1	$10.27	23	N/A	$182,240	2009 traffic volumes; pilot numbers and revenue estimated for 2012
Savannah Pilots	Savannah River	Container, dry bulk, roll-on/ roll-off, and general	25.5	2,586	107.3	$19.1	21	5	$654,720	2009 traffic volumes; pilot numbers and revenue estimated for 2012

Pilot Organization	Type of Geography	Type of Cargo	Length of Jurisdiction (miles)	Number of Vessels	Total Tonnage (million)	Total Revenue ($ millions)	Number of Pilots	Number of Apprentice Pilots	Pilot Net Salary	Base Year for Data
Charleston Branch Pilots	City of Charleston and the Cooper, Wando, and Ashley Rivers	N/A	7	1,843	N/A	$12.1	20	3	$392,843	2009 traffic volumes; pilot numbers and revenue estimated for 2012
Puget Sound Pilots	Ports of Tacoma, Anacortes, Seattle, Bellingham, Manchester, Everett, Olympia, and Port Angeles	Full range	N/A	N/A	N/A	N/A	52.6	N/A	$338,071	Interim final projections for 2011
Columbia River Bar Pilots	Across the Columbia River Bar; exchange with Columbia River Pilots at Astoria, OR	N/A	15	N/A	N/A	N/A	N/A	N/A	$214,447	2010 filing of 2012 target
Columbia River Pilots	All shipping on the Columbia River and its tributaries	N/A	N/A	N/A	N/A	N/A	43.02	N/A	$214,447	2011 target

Pilot Organization	Type of Geography	Type of Cargo	Length of Jurisdiction (miles)	Number of Vessels	Total Tonnage (million)	Total Revenue ($ millions)	Number of Pilots	Number of Apprentice Pilots	Pilot Net Salary	Base Year for Data
San Francisco Bar Pilots	San Francisco Bay system, including Stockton and Sacramento	Container, tankers, bulk cargo, and military vessels	N/A	N/A	N/A	N/A	N/A	N/A	$395,714	2010 average
Los Angeles Pilots		N/A	N/A	N/A	N/A	N/A	13	N/A	$326,856	2011
Hawaii Pilots	State of Hawaii, 7 ports and 1 anchorage at 4 islands	N/A	170	N/A	N/A	$4.19	10	N/A	$212,894	Revenue from 2009; compensation average of 2008 and 2009 actual
Columbia River Pilots*	N/A	N/A	N/A	1,442	N/A	$16.89	43	N/A	302,150	Estimated for 2010

Notes:

N/A – Indicates the data was not presented in the report.

** – Indicates data row was from the Oregon Board of Maritime Pilots, "In the Matter of the Columbia River Pilots for a Change in Pilotage Rates," Final Order No. 10-01.*

Comparison: Vessel Cargo Value

Trade statistics published by the U.S. Department of Commerce (DOC) provide statistics on the value of cargo exported/imported into various customs districts. The DOC publishes the *FT920 U.S. Merchandise Trade: Selected Highlights* annually. It includes the value, in millions of dollars, and the shipping weight, in kilograms, of the imports and exports for each of the of the U.S. customs districts. These values are further attributed to a method of transportation, either vessel or air. **Table D-2: U.S. Exports – Domestic and Foreign Merchandise** is an extract of the value and shipping weight for the 2011 annual exports where the method of transportation is vessel. **Table D-3: U.S. General Imports** is an extract of the value and shipping weight for the 2011 annual imports where the method of transportation is vessel.

Calculations were made off the value and shipping weight numbers to demonstrate the percent of total that each customs district is responsible for contributing. Additionally, the relative value per kilogram has been calculated for each customs district to enable the comparison of the value per kilogram.

The Great Lakes customs districts are highlighted in yellow. These eight customs districts are summed together at the bottom of the table to create a single Great Lakes Region. The combined Great Lakes customs districts represent 1.2% of the vessel transported export value and 0.4% of the vessel transported import value. The relative value per unit shipping weight is lower for the combined Great Lakes customs districts than for any other single customs district. This indicates that the international vessel cargo on the Great Lakes is lower in relative value in comparison to other U.S. ports.

Table D-2: U.S. Exports – Domestic and Foreign Merchandise

District Code		Vessel Data Annual 2011				
		From FT920 Report		Calculated		
		Cargo Value (million $)	Shipping Weight (kilograms)	Value as a % of Total Value	Shipping Weight as a as % of Total Shipping Weight	Value per Kilogram
	Total	**570,285.7**	**572,630.3**			**$1.00**
01	Portland, ME	685.6	849.3	0.1%	0.1%	$0.81
04	Boston, MA	2,156.5	2,283.0	0.4%	0.4%	$0.94
05	Providence, RI	364.6	665.4	0.1%	0.1%	$0.55
07	Ogdensburg, NY	1,097.6	2,163.3	0.2%	0.4%	$0.51
09	Buffalo, NY	716.9	4,643.4	0.1%	0.8%	$0.15
10	New York City, NY	57,799.1	24,465.7	10.1%	4.3%	$2.36
11	Philadelphia, PA	8,102.3	5,711.1	1.4%	1.0%	$1.42
13	Baltimore, MD	20,634.4	21,638.9	3.6%	3.8%	$0.95
14	Norfolk, VA	24,132.1	47,940.1	4.2%	8.4%	$0.50
15	Wilmington, NC	4,126.1	2,985.0	0.7%	0.5%	$1.38
16	Charleston, SC	22,233.5	6,454.8	3.9%	1.1%	$3.44
17	Savannah, GA	34,377.9	18,255.7	6.0%	3.2%	$1.88
18	Tampa, FL	16,191.4	10,331.3	2.8%	1.8%	$1.57
19	Mobile, AL	9,074.8	21,472.7	1.6%	3.7%	$0.42
20	New Orleans, LA	57,015.0	121,168.2	10.0%	21.2%	$0.47
21	Port Arthur, TX	10,765.7	18,284.4	1.9%	3.2%	$0.59
23	Laredo, TX	343.0	512.5	0.1%	0.1%	$0.67
25	San Diego, CA	106.6	22.1	0.0%	0.0%	$4.82
27	Los Angeles, CA	79,578.3	48,889.9	14.0%	8.5%	$1.63
28	San Francisco, CA	22,610.7	18,670.8	4.0%	3.3%	$1.21
29	Columbia-Snake, OR	12,990.5	34,106.1	2.3%	6.0%	$0.38
30	Seattle, WA	25,022.7	31,051.0	4.4%	5.4%	$0.81
31	Anchorage, AK	4,079.6	3,999.5	0.7%	0.7%	$1.02
32	Honolulu, HI	286.0	482.2	0.1%	0.1%	$0.59
34	Pembina, ND	0.6	0.9	0.0%	0.0%	$0.63
35	Minneapolis, MN	440.6	1,756.9	0.1%	0.3%	$0.25
36	Duluth, MN	181.3	112.9	0.0%	0.0%	$1.61
37	Milwaukee, WI	206.6	162.0	0.0%	0.0%	$1.28
38	Detroit, MI	3,339.5	7,580.7	0.6%	1.3%	$0.44
39	Chicago, IL	226.0	438.7	0.0%	0.1%	$0.52
41	Cleveland, OH	781.1	4,045.1	0.1%	0.7%	$0.19
49	San Juan, PR	3,396.1	972.6	0.6%	0.2%	$3.49
51	U.S. Virgin Islands	2,281.5	3,399.8	0.4%	0.6%	$0.67
52	Miami, FL	26,576.9	6,472.4	4.7%	1.1%	$4.11
53	Houston-Galveston, TX	108,943.3	100,640.8	19.1%	17.6%	$1.08
54	Washington, DC	2.9	1.5	0.0%	0.0%	$1.94
	Great Lakes Region	**6,989.6**	**20,903.0**	**1.2%**	**3.7%**	**$0.33**

Table D-3: U.S. General Imports

District Code		Vessel Data Annual 2011 From FT920 Report Cargo Value (million $)	Shipping Weight (kilograms)	Calculated Value as a % of Total Value	Shipping Weight as a as % of Total Shipping Weight	Value per Shipping Weight
	Total	**1,159,096.3**	**769,958.0**			**$1.51**
01	Portland, ME	3,790.8	6,854.4	0.3%	0.9%	$0.55
04	Boston, MA	-	-	-	-	-
05	Providence, RI	6,619.8	3,725.2	0.6%	0.5%	$1.78
07	Ogdensburg, NY	8.6	57.3	0.0%	0.0%	$0.15
09	Buffalo, NY	186.9	564.3	0.0%	0.1%	$0.33
10	New York City, NY	150,244.0	61,594.0	13.0%	8.0%	$2.44
11	Philadelphia, PA	46,218.5	50,225.3	4.0%	6.5%	$0.92
13	Baltimore, MD	30,757.0	12,693.1	2.7%	1.6%	$2.42
14	Norfolk, VA	30,857.8	8,904.4	2.7%	1.2%	$3.47
15	Wilmington, NC	6,299.9	4,428.7	0.5%	0.6%	$1.42
16	Charleston, SC	36,659.7	9,252.4	3.2%	1.2%	$3.96
17	Savannah, GA	51,345.5	15,725.8	4.4%	2.0%	$3.27
18	Tampa, FL	16,398.7	15,293.2	1.4%	2.0%	$1.07
19	Mobile, AL	22,371.6	32,787.4	1.9%	4.3%	$0.68
20	New Orleans, LA	96,346.2	136,271.9	8.3%	17.7%	$0.71
21	Port Arthur, TX	33,603.8	46,365.3	2.9%	6.0%	$0.72
23	Laredo, TX	944.6	1,602.0	0.1%	0.2%	$0.59
25	San Diego, CA	-	-	-	-	-
27	Los Angeles, CA	302,134.1	76,977.2	26.1%	10.0%	$3.92
28	San Francisco, CA	46,598.1	29,618.2	4.0%	3.8%	$1.57
29	Columbia-Snake, OR	9,343.3	5,139.6	0.8%	0.7%	$1.82
30	Seattle, WA	62,771.5	18,001.1	5.4%	2.3%	$3.49
31	Anchorage, AK	822.7	959.3	0.1%	0.1%	$0.86
32	Honolulu, HI	5,238.6	7,190.8	0.5%	0.9%	$0.73
34	Pembina, ND	-	-	-	-	-
35	Minneapolis, MN	225.4	493.4	0.0%	0.1%	$0.46
36	Duluth, MN	650.5	132.0	0.1%	0.0%	$4.93
37	Milwaukee, WI	172.2	1,220.8	0.0%	0.2%	$0.14
38	Detroit, MI	1,300.4	3,724.3	0.1%	0.5%	$0.35
39	Chicago, IL	1,439.7	3,490.6	0.1%	0.5%	$0.41
41	Cleveland, OH	1,231.2	6,033.6	0.1%	0.8%	$0.20
49	San Juan, PR	-	-	-	-	-
51	U.S. Virgin Islands	12,150.2	15,919.4	1.0%	2.1%	$0.76
52	Miami, FL	23,489.0	9,424.9	2.0%	1.2%	$2.49
53	Houston-Galveston, TX	-	-	-	-	-
54	Washington, DC	-	-	-	-	-
	Great Lakes Region	**5,214.8**	**15,716.2**	**0.4%**	**2.0%**	**$0.33**