Bridge Hour Definition and Methodology Study

Final Report

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U.S. Coast Guard
Great Lakes Pilotage Division (CG-WWM-2)
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EXECUTIVE SUMMARY

MicroSystems Integration, Inc. (MSI) conducted an independent review and analysis of the ratemaking process for Great Lakes pilotage services. The purpose of the study was to develop a series of recommended adjustments to the ratemaking process in order to:

- Increase objectivity;
- Increase transparency and understanding; and
- Promote stability of rates.

The Coast Guard acts in the public interest to ensure safe, efficient, and reliable pilot services are provided on the Great Lakes. One of their responsibilities is to "prescribe rates and charges for pilotage services, giving consideration to the public interest and the costs of providing the services."[1] Setting rates too low increases the risk of not sustaining or attracting an adequate number of professional pilots, leading to overworked, fatigued pilots and traffic delays. Setting rates too high potentially impacts commerce on the Great Lakes. The structure of the ratemaking methodology in Appendix A of 46 CFR 404 provides a means to balance across competing needs.

The process for determining revenue required reduces to the following:

Revenue Required to Promote Safe, Efficient & Reliable Pilotage

$$\left(\left(\begin{array}{c}Operating\\Expenses\end{array}\times\begin{array}{c}Time\,Value\\of\ Money\end{array}\right)+\left(\begin{array}{c}\#\ of\\Pilots\end{array}\times\begin{array}{c}Pilot\\Comp.\end{array}\right)\right)\times ROI$$

Figure ES-1: Determining Revenue Required

The framework for the ratemaking methodology strikes a balance between revenue required and revenue generated.

Balancing Revenue

$$Revenue\ Required = Revenue\ Generated$$

Figure ES-2: Balancing Revenue

Projections for revenue generated are based on the anticipated demand and the tariff per trip charged. The difference between revenue required and revenue generated is the net revenue. If required revenue is too high, a revenue gap occurs. If revenue generated is too high, a revenue surplus occurs. The ratemaking process provides this balance.

MSI examined the parameters associated with estimating revenue requirements and projecting revenue generated. A summary of issues and recommended adjustments to balance revenue

[1] 46 U.S.C. 93

required and revenue generated is presented in **Table ES-1: Ratemaking Parameter Issues and Significant Recommended Adjustments.** The recommended adjustments support a more objective, transparent, and stable means of balancing revenue required and revenue generated.

Table ES-1: Ratemaking Parameter Issues and Significant Recommended Adjustments

Parameter	Issues/Recommended Adjustments
Operating Expenses	Operating expenses are independently audited and assumed to be accurate within this analysis.
Time Value of Money	Currently, only a single following year[2] inflationary factor is applied to expenses. There are two or three years' lag between the last completed audit of expenses and the execution of the ratemaking process for the upcoming year. <u>Recommended Adjustments:</u> • Account for the time-value of money by applying an inflation factor for each year from the year the audit of expenses was taken to the year rates are being established. Continue use of the CPI-U for the Midwest Region to determine inflation escalation factors for each year between the last audit and the year of ratemaking.
Number of Pilots	The number of pilots is currently determined by dividing the projected bridge hours by a seasonal work standard, causing four issues: • The term "Bridge Hour" is ambiguous and is applied in multiple steps of the ratemaking process – impacting both estimated revenue required and projected revenue generated. Lowering projected Bridge Hours results in projecting fewer pilots (lower required revenue) but increases projected tariffs (higher cost charged per hour). • The concept of "Bridge Hours" does not account for the full spectrum of pilot activities impacting assignments. Additionally, it is difficult to project bridge hours relative to projected ship traffic. • Projections of bridge hours have been based on previous projections, resulting in errors in previous years being carried forward to the next projection As a result, projected bridge hours have exceeded actual bridge hours in the past. This is a compounding contributor to the revenue gap. A bridge hour projection that is too high results in more pilots than needed (higher costs) and lower tariffs (lower cost charged per hour). • The history of establishing a 1,000/1,800 Bridge Hour standard provides limited basis or validation for the standard. Our analysis of pilot activities determined that in some Areas the current Bridge Hour standard exceeds maximum pilot capacity when taking into consideration all activities that are reasonable and necessary to provide pilotage services. <u>Recommended Adjustments:</u> • Clarify the terminology to account for the total pilot workload to complete an assignment. Convert workload calculations from "Hours" to "Assignments" to provide more transparency and stability. "Assignments" provides a more direct relationship to the collection of activities performed by the pilots and the services provided and chargeable to industry. • Baseline projected demand based on historical traffic demand. Use a three-year hybrid historical average to project demand consisting of two years of historical data and one year of projected demand. • Establish a "Pilot Assignment Cycle" accounting for all activities associated with providing pilotage services including: travel from the pilot's "homeport" or "base," pilot boat travel, delay, detention, administrative time, and mandatory rest in addition to the

[2] The "succeeding navigation season" as outlined in 46 CFR 404, Appendix A, Step 1.C.

Parameter	Issues/Recommended Adjustments
	time underway with the vessel. • Use the Pilot Assignment Cycle as the basis for estimating a pilot's maximum capacity and establishing a Seasonal Work Standard. The Seasonal Work Standard will vary by Area due to varying operations within each Area. Establish a pilot utilization factor that compensates for inefficiencies in scheduling pilot assignments to match ship movements and retains sufficient pilot capacity for surge demand. • Estimate staffing requirements by projecting surge demand based on historical data. Establish a cutoff point to minimize the number of occurrences where surge traffic exceeds the number of pilots on the Tour de Role when balanced against excessive pilot capacity.
Pilot Compensation	Pilot compensation is currently based on the American Maritime Officers (AMO) union contracts. AMO union contract information is not publicly available, and this year compensation was dramatically lower than previously reported figures. Separate compensation rates are determined for designated and undesignated waters pilots, despite the fact that pilot qualifications, responsibilities, and expected level of service are the same. <u>Recommended Adjustments:</u> • Establish a single target compensation rate for all pilots. • Base pilot compensation on a process in which pilots propose adjustments to compensation, industry and stakeholders provide comments and opinions, the Great Lakes Pilotage Advisory Committee (GLPAC) reviews and provides a recommendation, and the Coast Guard considers these inputs in the ratemaking process. Utilize an annual escalation for the pilot compensation for the term of the rate.
Return on Investment (ROI)	The intent of ROI is to promote investment in infrastructure, new technologies, and training. The application of ROI in the current ratemaking methodology is too limited in scope to encourage investments. The net result of the ratemaking calculation is that all risks associated with unrealized demand projections is borne by the pilots. This situation discourages investments to improve service. <u>Recommended Adjustments:</u> • Close the revenue gap and provide for a Business Risk Reserve to promote investment.
Tariffs	Tariffs collected have been insufficient to cover the revenue required, resulting in a revenue gap that has occurred in the past. The existence of a revenue gap encourages minimal staffing (increasing risk) and discourages investments in infrastructure, new technologies, and training. Contributing factors to the Revenue Gap are: • The influence of projected demand on both the estimated revenue required and the projected revenue generated conflicts. If demand is projected too high to maintain adequate staffing levels, the estimation of tariffs is reduced (lower cost per hour charged), and sufficient revenue is not generated. • The basis for established rates on the tariff card is not known, and the tariff card has not been updated on a regular basis to reflect adjustments to traffic density and distribution. • The current use of the rate multiplier to update the tariffs compounds the problems with prior-year tariffs and carries forward the lack of basis in establishing the original tariffs. • The current billing scheme is based on multiple parameters, which are not based on historical demand or revenue generated. <u>Recommended Adjustments:</u> In order to address issues associated with projecting revenue generated: • Structure the tariff card as a set of point-to-point transits, based on standard transit times and supplemental charges when those standards are exceeded. • Baseline the tariff card every three years to align charges with actual traffic distribution experienced and compensating for the various weight classes of vessels.

An overall system assessment of the Great Lakes pilotage ratemaking methodology identified issues and findings in other areas related to the ratemaking methodology. Key recommendations include:

- Conduct a full system risk assessment.
- Update pilot association working rules to make them current, more consistent, and to clarify ongoing practices (e.g., rest periods, double pilotage, mitigating long transits).
- Adjust the ratemaking governance process to increase communications between pilots and industry prior to proposing new rates.
- Improve the information within the Klein system to make it more complete and consistent. Increasing the consistency of information supports more objective inputs into the ratemaking process and improves monitoring and management of the system.

In conducting the review and analysis, MSI researched available references and held discussions with stakeholders, listed in **Table ES-2: Summary of Stakeholder Discussions and Feedback.** Comments were captured from these discussions and from written correspondence on both the initial and updated drafts. Those comments were considered, reconciled, and adjudicated for inclusion in the report.

Table ES-2: Summary of Stakeholder Discussions and Feedback

Date	Input	Organization
9/18/12	Discussion	Shipping Federation of Canada (ShipFed)
9/19/12	Discussion	Canadian Great Lakes Pilotage Authority (GLPA)
9/25/12	Discussion	U.S. Great Lakes Shipping Association
10/18/12	Discussion	International Organization of Masters, Mates, and Pilots
10/18/12	Discussion	Pilot Associations Introductions at the American Pilots Association Conference
10/19/12	Discussion	Retired Shipping Federation of Canada Subject Matter Expert
10/19/12	Discussion	Lake Carriers' Association
10/24/12	Discussion	St. Lawrence Seaway Pilots Association
10/29/12	Discussion	St. Lawrence Seaway Management Corporation
10/31/12	Discussion	American Great Lakes Ports Association
10/31/12	Discussion	American Pilots Association
11/4/12	Discussion	Western Great Lakes Pilots Association
11/6/12	Discussion	Lakes Pilots Association
11/14/12	Discussion	St. Lawrence Seaway Development Corporation
11/19/12	Discussion	Canadian Laurentian Pilots Authority
12/19/12	Discussion	Associated Branch Pilots (Louisiana)
1/24/13	Feedback	E-mail from Coast Guard WWM-2
2/9/13	Feedback	E-mail and attachment from U.S. Great Lakes Shipping Association
2/11–2/12/13	Discussion/ Feedback	GLPAC meeting, Pilot Focus Group, Industry Focus Group
2/18/13	Feedback	E-mail from CAPT Harris
2/20/13	Discussion	ShipFed

Date	Input	Organization
2/21/13	Feedback	E-mail from WGLPA
2/28/13	Feedback	Letter from WGLPA
3/1/13	Discussion	ShipFed
3/5/13	Feedback	Letter from Saint Lawrence Seaway Development Corporation
3/11/13	Feedback	Letter from CAPT Swartout
3/13/13	Feedback	E-mail from CAPT Harris
3/15/13	Feedback	E-mail from CAPT Dan Gallagher
4/3/13	Feedback	E-mail from Mr. Broad
4/17/13	Discussion	ShipFed
4/29/13	Discussion	GLPA
5/7/13	Feedback	Letter from International Longshoremen's Association
5/8/13	Feedback	E-mail with attachment from U.S. Great Lakes Shipping Association
5/9/13	Feedback	E-mail from CAPT Swartout, WGLPA
5/9/13	Feedback	Letter from ShipFed
5/10/13	Discussion	International Longshoremen's Association
5/10/13	Feedback	E-mail from North American Stevedoring Company, LLC
5/10/13	Feedback	E-mail from Lake Pilots Association
5/16/13	Feedback	Letter from K&L Gates on behalf of the pilot associations.

Klein system data from 2008–11[3] was used in the quantitative analysis and in the example calculations for each recommended adjustment, 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.

Criteria were developed to assess alternative recommended adjustments to the key parameters in the ratemaking process. Criteria identified are grouped into four assessment categories, as shown in **Table ES-3: Recommended Adjustment Assessment Criteria.**

Table ES-3: Recommended Adjustment Assessment 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 • Clarity • Accounts for Interdependency • Promotes Investment

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

The collection of recommended adjustments increases the objectivity, transparency, and stability of the system. Basing the calculations on objective inputs derived from actual historical data within the Klein system and identified benchmarks provides a self-correcting process that is less influenced by the application of judgment within the process.

An increase in rates is necessary to close a revenue gap that has persisted as a result of using previous years' estimates to project rates – carrying forward previous errors in those estimates. Follow-on rates should stabilize once this revenue gap is closed.

Currently available information and data was used in this study to identify, validate, and demonstrate issues and recommended adjustments. Applicable information and data will need to be updated and applied for the set of selected recommended adjustments when incorporated into a rulemaking.

This report and the recommended adjustments are to be presented to the GLPAC in July 2013.

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Key Terms

The following terms developed in the course of this study or referenced from the indicated regulation are key to understanding the analysis and recommendations presented within this report.

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 reasonable and necessary 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 "[a]vailable 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.

1.1 Purpose

MicroSystems Integration, Inc. (MSI) was tasked to conduct an independent review and an analysis of the ratemaking process for Great Lakes pilotage services. The purpose of the study was to develop a series of recommended adjustments to the ratemaking process in order to:

- Increase objectivity;
- Increase transparency and understanding; and
- Promote stability of rates.

The ratemaking methodology was assessed as a system, balancing the estimated revenue required and the projected revenue generated. As part of the assessment, MSI considered the bridge hour definition, seasonal work standards, staffing levels, return on investment (ROI), benchmarks, and the efficacy of current billing schemes. Other parameters were identified that influence the ratemaking process and were reviewed as they relate to impacting revenue required or generated.

1.2 Scope

The review and analysis was carried out to identify recommended adjustments to the methodology for estimating required revenue and projecting revenue generated as described in Appendix A of 46 CFR 404. This report and the recommended adjustments are to be presented to the Great Lakes Pilotage Advisory Committee (GLPAC).

A fair and reasonable approach to determining pilotage fees needs to balance many factors, as depicted in **Figure 1: Pilotage Stakeholder Interests.** Stakeholder interests overlap and share many of these factors. The Coast Guard is charged with balancing these factors in the public interest.

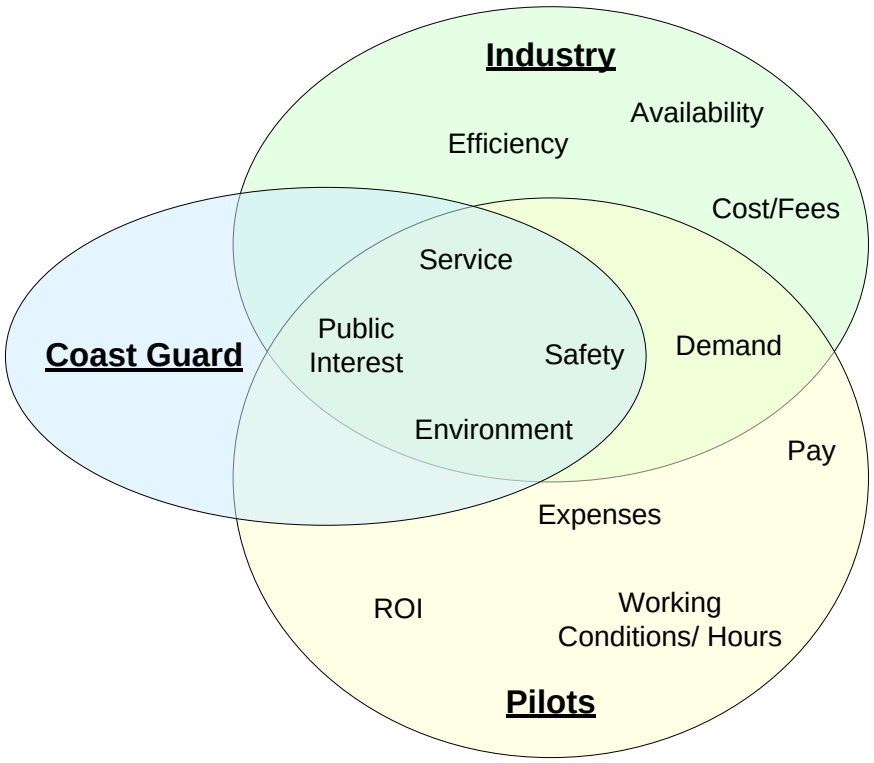

Figure 1: Pilotage Stakeholder Interests

1.3 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

	District 1	District 2	District 3
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
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

	District 1	District 2	District 3
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.)	Owned 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." Pilots who drive more than 3 hours may take a half-hour rest for each hour at the destination.
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 bonus.
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 2: 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 3: District 1 Bridge Time Areas and Change Points** through **Figure 5: 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. Pilots are also required to be on the bridge during port approaches.

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.

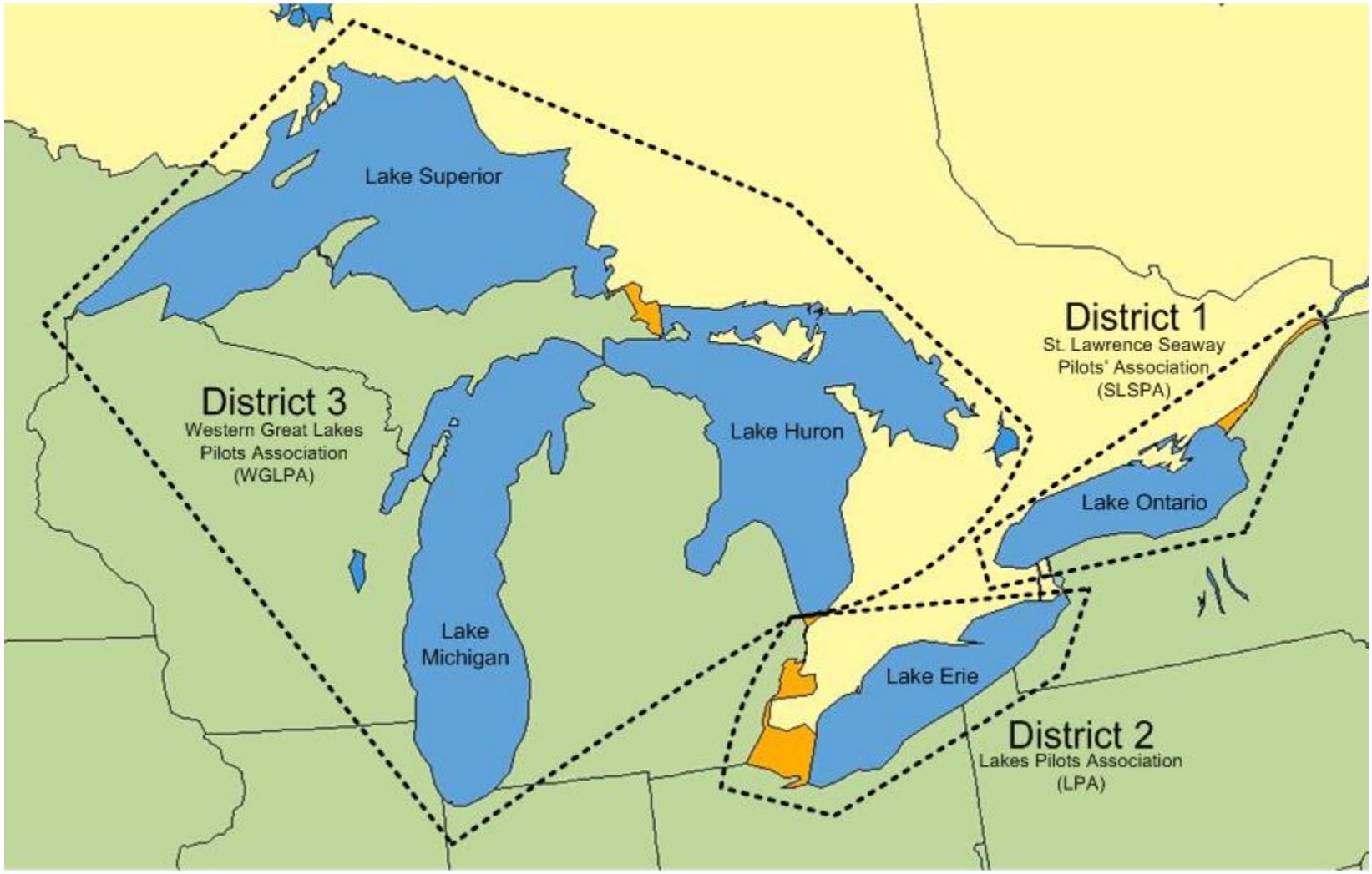

Figure 2: Great Lakes Pilotage Districts

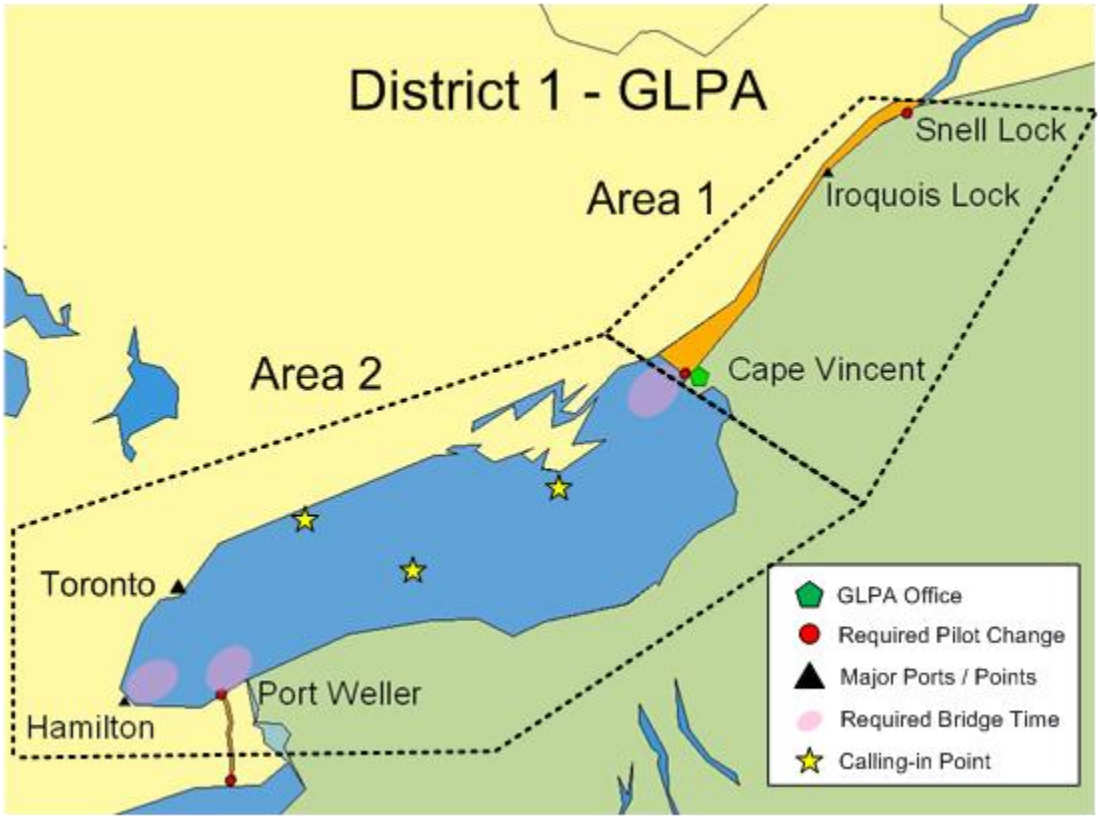

Figure 3: District 1 Bridge Time Areas and Change Points

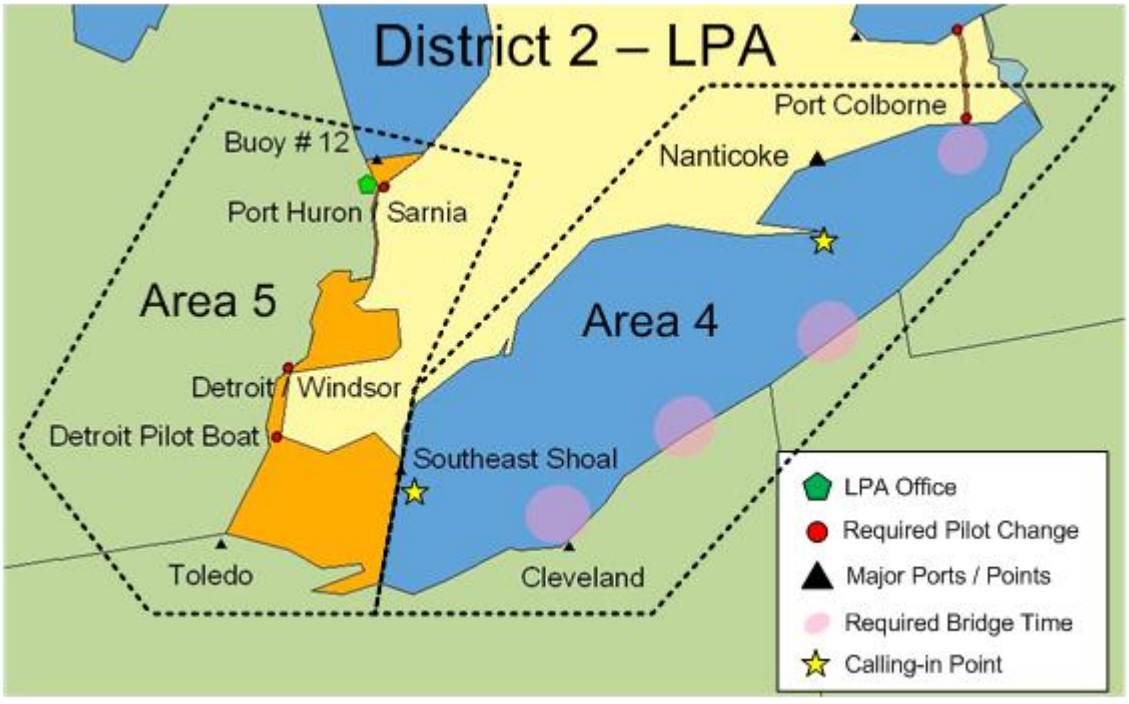

Figure 4: District 2 Bridge Time Areas and Change Points

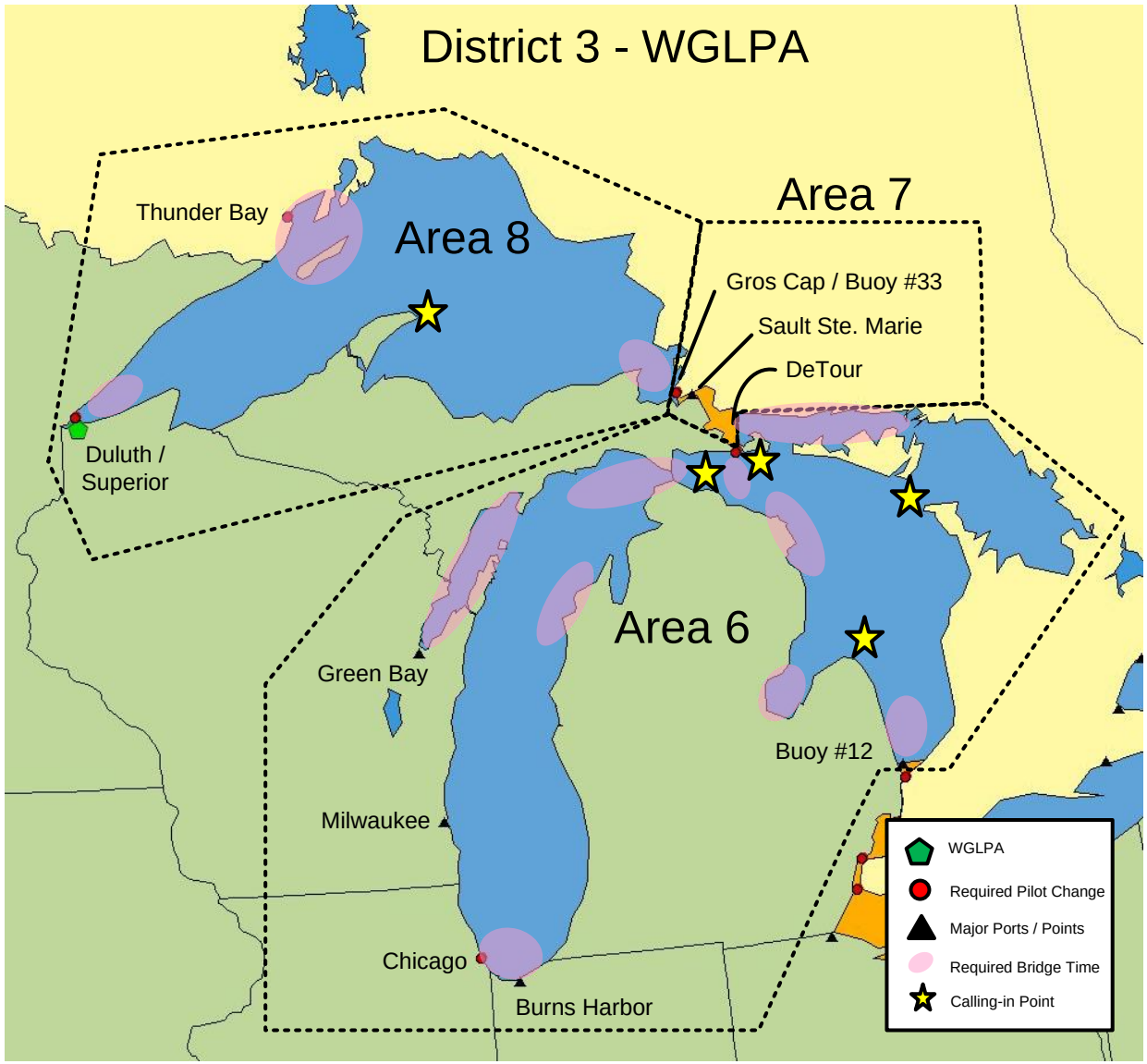

Figure 5: District 3 Bridge Time Areas and Change Points

1.4 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 analysis is scoped to 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 6: Appendix A Ratemaking Methodology**. Ratemaking steps emphasized in this study are circled in green. Those factors in red (asterisks) were identified as 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[4] to determine if they are necessary and reasonable. Operating expenses are adjusted for inflation. The process of determining operating expenses was outside the scope of this report.
- **Step 2 – Projection of Target Pilot Compensation**.[5] A projection of the annual amount of target pilot compensation that pilotage rates should provide in both undesignated and designated waters is conducted. The current methodology bases a total compensation figure on American Maritime Officers (AMO) union contracts and multiplies that figure by the number of pilots. Pilot compensation rates are calculated for both undesignated and designated areas through a series of weighted average calculations. Determining the number of pilots is based on the projected demand for services and the expected work standard of a pilot in each Area. This study looked at three contributing factors to estimate pilot compensation:
  - Methods for estimating the total compensation for pilots;
  - Projecting 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) and staffing levels to respond to surge demand.
- **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 by 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.

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

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

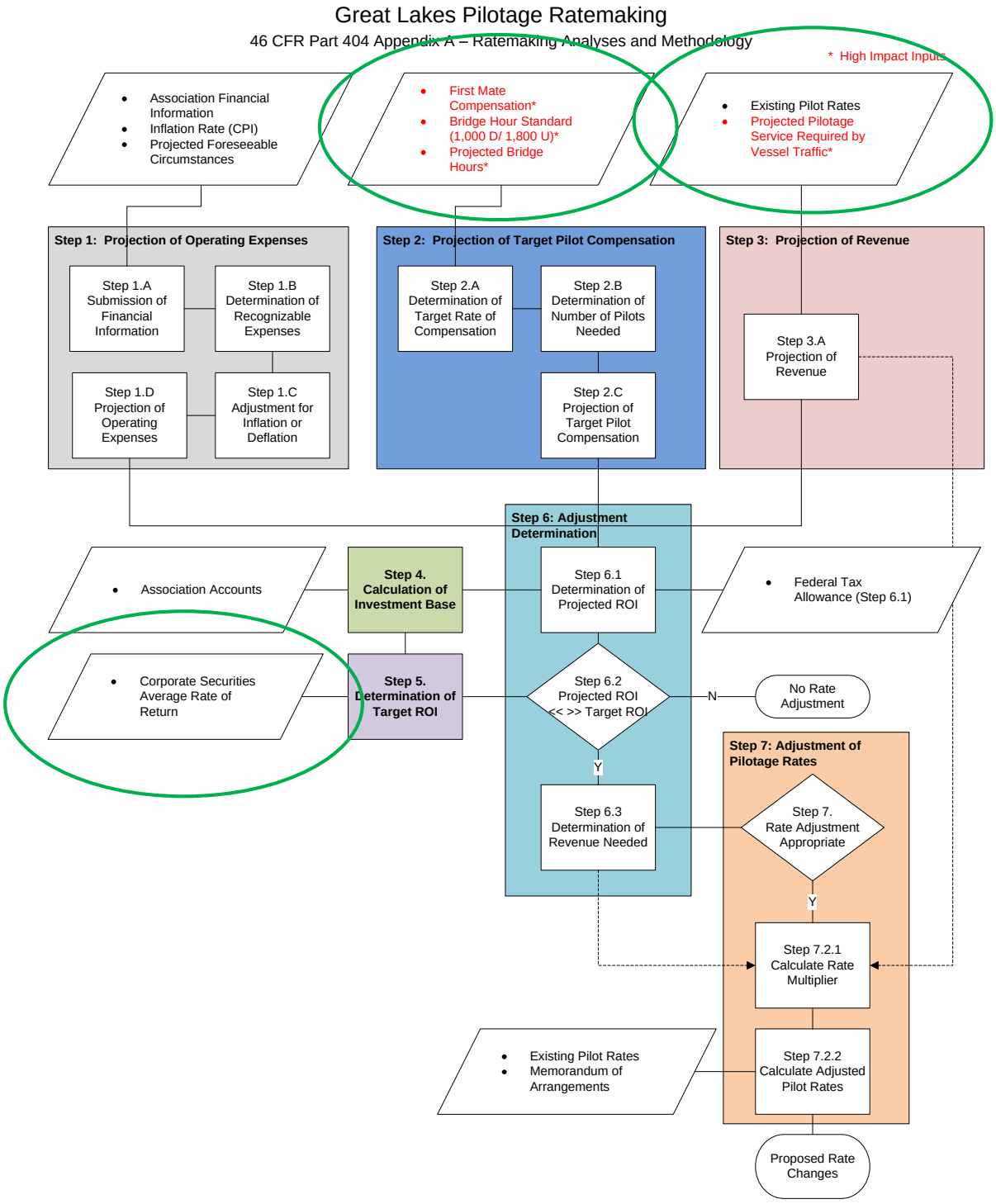

Figure 6: Appendix A Ratemaking Methodology

- **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 recognized net capital invested 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.
- **Step 5 – Determination of Target Rate of Return on Investment**. A determination for a market-equivalent ROI 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, pilotage rates are adjusted upward; if higher, rates are 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.

The process for determining revenue required reduces to the following:

Revenue Required to Promote Safe, Efficient & Reliable Pilotage

$$\left(\left(\begin{array}{c}Operating\\Expenses\end{array}\times\begin{array}{c}Time\,Value\\of\ Money\end{array}\right)+\left(\begin{array}{c}\#\ of\\Pilots\end{array}\times\begin{array}{c}Pilot\\Comp.\end{array}\right)\right)\times ROI$$

Figure 7: Determining Revenue Required

The framework for the ratemaking methodology strikes a balance between revenue required and revenue generated.

Balancing Revenue

$$Revenue\ Required = Revenue\ Generated$$

Figure 8: Balancing Revenue

Projections for revenue generated are based on the anticipated demand and the tariff per trip charged. The difference between revenue required and revenue generated is the net revenue. If required revenue is too high, a revenue gap occurs. If revenue generated is too high, a revenue surplus occurs. The ratemaking process provides this balance.

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. Parameters within the ratemaking methodology are highly independent. A system perspective across all parameters is required to account for all interactions and avoid unintended consequences of adjusting parameters individually.
- **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 **Appendix A.3**. 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 publically available compensation rates of comparable services in both the private/state-controlled pilot associations and within the federal government was conducted. An analysis of factors correlated to pilot compensation 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 and Feedback.** A focus group with industry and the pilots was held in conjunction with a GLPAC meeting in February 2013 to present the initial draft

report and capture comments. An updated draft report was provided to stakeholders in March 2013 for their comments by May 2013.

Table 2: Listing of Stakeholder Discussions and Feedback

Date	Input	Organization	Participants
9/18/12	Discussion	Shipping Federation of Canada (ShipFed)	• Mr. Michael Broad, President, ShipFed • 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.
9/19/12	Discussion	Canadian Great Lakes Pilotage Authority (GLPA)	• Robert Lemire, President and Chief Executive Officer • CAPT Daniel Trottier, Director of Operations • Rejean Menard, Secretary/Treasurer
9/25/12	Discussion	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.
10/18/12	Discussion	International Organization of Masters, Mates, and Pilots	• Mr. George Quick, Vice President, Pilots, International Organization of Masters, Mates, and Pilots
10/18/12	Discussion	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
10/19/12	Discussion	Retired Shipping Federation of Canada Subject Matter Expert	• CAPT Ivan Lantz (retired), Shipping Federation of Canada Director of Marine Operations
10/19/12	Discussion	Lake Carriers' Association	• Mr. Jim Weakley, President, Lake Carriers' Association (LCA)
10/24/12	Discussion	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

Date	Input	Organization	Participants
10/29/12	Discussion	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
10/31/12	Discussion	American Great Lakes Ports Association	• Mr. Steve Fisher, Executive Director, American Great Lakes Ports Association
10/31/12	Discussion	American Pilots Association	• Mr. Clay Diamond, Deputy Director, American Pilots Association
11/4/12	Discussion	Western Great Lakes Pilots Association	• CAPT Donald Willecke, President • CAPT Mark LaValley, Vice President • Jay Hartlieb, Accountant • Donna Webster, Dispatcher • CAPT Steve Vandercook, Pilot
11/6/12	Discussion	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
11/14/12	Discussion	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
11/19/12	Discussion	Canadian Laurentian Pilots Authority	• CAPT Denys Pouliot, President, Hapag Lloyd
12/19/12	Discussion	Associated Branch Pilots	• CAPT Mike Lorino, President, Associated Branch Pilots
1/24/13	Feedback	U.S. Coast Guard (WWM-2) e-mail	• Todd Haviland, Director Great Lakes Pilotage
2/9/13	Feedback	U.S. Great Lakes Shipping Association e-mail w/attach.	• Mr. Stuart Theis
2/11–2/12/13	Discussion Feedback	GLPAC meeting, Pilot Focus Group, Industry Focus Group	• 25 pilot representatives, 9 industry representatives
2/18/13	Feedback	Western Great Lakes Pilots Association e-mail	• CAPT Ed Harris

Date	Input	Organization	Participants
2/20/13	Discussion	Shipping Federation of Canada (ShipFed)	• Mr. Michael Broad • Mr. Jean Francois Belzile • Mr. Andrew Digby • Mr. David Grieve • Mr. Robert Vandenende • Mr. Donal Poirier
2/21/13	Feedback	Western Great Lakes Pilots Association e-mail	• CAPT Robert Krause
2/28/13	Feedback	Western Great Lakes Pilots Association letter	• CAPT John Swartout
3/1/13	Discussion	Shipping Federation of Canada (ShipFed)	• Mr. Michael Broad • Mr. Jean Francois Belzile • Mr. Andrew Digby • Mr. David Grieve • Mr. Robert Vandenende
3/5/13	Feedback	St. Lawrence Seaway Development Corporation letter	• Mr. Craig Middlebrook
3/11/13	Feedback	Western Great Lakes Pilots Association	• CAPT John Swartout
3/13/13	Feedback	Western Great Lakes Pilots Association e-mail	• CAPT Ed Harris
3/15/13	Feedback	Lake Pilots Association e-mail	• CAPT Dan Gallagher
4/3/13	Feedback	ShipFed e-mail	• Mr. Michael Broad
5/7/13	Feedback	International Longshoremen's Association letter	• Mr. William Yockey, International Vice President
5/8/13	Feedback	U.S. Great Lakes Shipping Association e-mail w/attach.	• Mr. Stuart Theis
5/9/13	Feedback	Western Great Lakes Pilots Association e-mail w/attach.	• CAPT John Swartout
5/9/13	Feedback	ShipFed letter	• CAPT Jean-François Belzile
5/10/13	Discussion	International Longshoremen's Association discussion	• Mr. John Baker, Sr.
5/10/13	Feedback	North American Stevedoring Company, LLC e-mail	• Mr. Ian Hirt, General Manager
5/10/13	Feedback	Lake Pilots Association, e-mail	• CAPT Dan Gallagher
5/16/13	Feedback	K&L Gates, letter	• Mr. Mark Ruge, Legal Counsel

- **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. The data in the Klein system was used to review and validate the structure of the calculations being recommended. Data in the Klein system was deemed incomplete or inaccurate by the stakeholders due to inconsistent use of the Klein system and practices for correcting information. Gaps in information were filled out according to a governing set of assumptions in order to present example calculations. Calculations based on

the Klein system data 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. The data analysis was also used to determine the frequency and severity of anecdotes shared by stakeholders to consider when recommending adjustments (e.g., excessive detention; long transits).

- **Develop report.** The draft report was presented to GLPAC and stakeholder groups during focus meetings following the GLPAC meeting in February 2013. Comments received on the initial draft report were considered, reconciled, and adjudicated for inclusion in the report. The updated draft report was open for comments from stakeholders from 20 March to 9 May 2013. The Final Report is to be presented to GLPAC in July 2013. A summary of discussions held during the review of the draft is provided in **Table 3: Discussions on Draft Report**.

Table 3: Discussions on Draft Reports

Date	Draft	Organization	Participants
2/11/13	Initial	GLPAC meeting	• 6 Coast Guard representatives • 6 Industry representatives (1 Canadian) • 25 Pilot representatives (3 Canadian and 1 visiting)
2/11/13	Initial	Pilot Focus Group	• 25 Participants (3 Canadian)
2/12/13	Initial	Industry Focus Group	• 9 Participants (2 Canadian)
2/20/13	Initial	ShipFed	• 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 of Operations, FEDNAV • Mr. Robert Vandenende, Gresco Ltd. • Mr. Donal Poirier, President, Hapag Lloyd
3/1/13	Initial	ShipFed	• Mr. Michael Broad • Mr. Jean Francois Belzile • Mr. Andrew Digby • Mr. David Grieve • Mr. Robert Vandenende
4/17/13	Updated	ShipFed	• Mr. Michael Broad • Mr. Jean Francois Belzile • Mr. David Grieve • Mr. Robert Vandenende
4/29/13	Updated	GLPA	• Robert Lemire
5/10/13	Updated	International Longshoremen's Association	• Mr. John D. Baker, Sr.

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 of 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 of operating expenses 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 operating 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 work standard 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. 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, the findings and recommendations from this report will need to be revisited.
- The Klein system is intended to be the authoritative source for operational data.
- Currently available information and data was used in this study to identify, validate, and demonstrate issues and recommended adjustments. Applicable information and data will need to be updated and applied for the set of selected recommended adjustments when incorporated into a rulemaking.

1.7 Evaluation Criteria

The overall objective of the Great Lakes pilotage system is to provide safe, effective, and reliable pilot services on the Great Lakes. This will result in safe and efficient movement of commerce on the Great Lakes at a competitive cost. Key alternatives were evaluated against a set of criteria in the general areas of safety, efficiency, and cost of providing pilot services on the Great Lakes. Impacts on the ratemaking process itself are also evaluated. The criteria used in each of these assessment categories are provided in **Table 4: Recommended Adjustment Assessment Criteria.** The scope of each assessment category is as follows:

- **Safety** – Addresses to what extent the probability of an occurrence is increased or decreased and how the consequences can be mitigated.
- **Efficiency/Reliability** – Efficiency of the system (e.g., delays or adverse movements).
- **Cost** – Increased costs and reduced competitiveness with other modes of transportation.
- **The Ratemaking Process** – The ability for the process to inform and engage stakeholders, promotes improvement, increase cooperation, and produce acceptable results.

Table 4: Recommended Adjustment Assessment 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 • Clarity • Accounts for Interdependency • Promotes Investment

1.8 Document Overview

This document is organized into the following sections and appendices:

- **Section 1: Introduction** – Describes the purpose, scope, and organization of this report. An overview of the Great Lakes ratemaking methodology and a summary of the system of Great Lakes pilotage associations is presented as background information.
- **Section 2: Issues and Findings** – Presents an overview on issues, recommended adjustments, and system recommendations associated with the Great Lakes pilotage system. A more detailed and complete discussion is provided in **Appendix B**.
- **Section 3: Recommendations** – Presents the collection of recommended adjustments and recommendations. Interrelationships among the recommended adjustments and example calculations of 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: Amplifying Discussion and Assessments** – Presents more detailed discussion and assessments for key issues discussed in Section 2. Example calculations are provided to illustrate the recommended adjustment.
- **Appendix C: Supporting Data** – Summarizes data extracted from the Klein system used in this analysis.
- **Appendix D: Pilotage Services Comparison** – Provides comparative information on pilotage services including pilot association parameters from around the country taken from the Dibner report and a comparison of the value of imports and exports for various ports.

2 ISSUES AND FINDINGS

The ratemaking methodology was assessed as a system, balancing the estimated revenue required and the projected revenue generated. As part of the assessment, MSI considered the bridge hour definition, seasonal work standards, staffing levels, return on investment (ROI), benchmarks, and the efficacy of current billing schemes. Other parameters were identified that influence the ratemaking process and were reviewed as they relate to impacting revenue required or generated. Issues and findings are presented in five areas:

- System Implications
- Net Revenue
- Ratemaking Benchmarks
- Sustaining Pilot Proficiency
- Ratemaking Management/Governance

2.1 System Implications

Parameters within the ratemaking process interact as a system. Adjustment of one parameter needs to balance the risks of the effects on the other parameters. Within the current ratemaking process, the effects of adjusting projected demand are compounded because of its contribution to both estimating costs and projecting revenue:

- A bridge hour projection that is too high results in more pilots than needed (higher costs) and lower tariffs (lower cost charged per hour).
- A bridge hour projection that is too low results in fewer pilots (increasing the risk of insufficient capacity to respond to surge demand) and higher tariffs.

Appropriate staffing levels need to reflect sufficient pilots to meet demand (to avoid delays) within reasonable workloads (to avoid fatigue-related risks). Determining appropriate staffing levels objectively requires a seasonal work standard for pilots and a reasonably accurate projection of demand.

2.1.1 Seasonal Work Standard

A seasonal work standard is the reasonable 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" and is set at 1,800 hours for undesignated waters and 1,000 hours for designated waters. An analysis of all necessary and reasonable activities to provide pilotage services was conducted. From that analysis, it was found that there are significant issues associated with the current 1,000/1,800 Bridge Hour standard:

- The history establishing a standard provides limited basis or validation for the standard reflecting pilot capacity.
- Operations within each Area vary.

- The concept of "designated" and "undesignated" waters is a legal distinction for pilotage carriage requirements and duties and does not address the consumption of pilot capability and capacity.
- In some Areas the current Bridge Hour standard hours exceed maximum pilot capacity. When taking into consideration all activities that are reasonable and necessary to provide pilotage services, the standard can only be achieved if scheduling of pilots is exactly sequential/nonstop throughout the entire season. It is unreasonable to expect pilots to obtain this maximum.

A seasonal work standard needs to take into account all activities that are necessary and reasonable to provide pilotage services. To remove ambiguity, and avoid conflict in application, the collection of terms depicted in **Figure 9: Recommended Pilot Activity Terminology** has been developed and is used in this report. The terms shown in the figure are defined in detail in **Appendix B.1.**

The concept of "Assignments" provides a direct relationship to the collection of activities performed by the pilots and the services provided and chargeable to industry. The use of "assignments" more tightly couples the calculations for estimated revenue required and projected revenue generated. An assignment is easier to envision when projecting how many there will be, what service is being provided to the customer, and how many a pilot can complete.

A "Pilot Assignment Cycle" includes all activities necessary and reasonable to provide pilot services and is used as the basis for determining pilot seasonal workload.

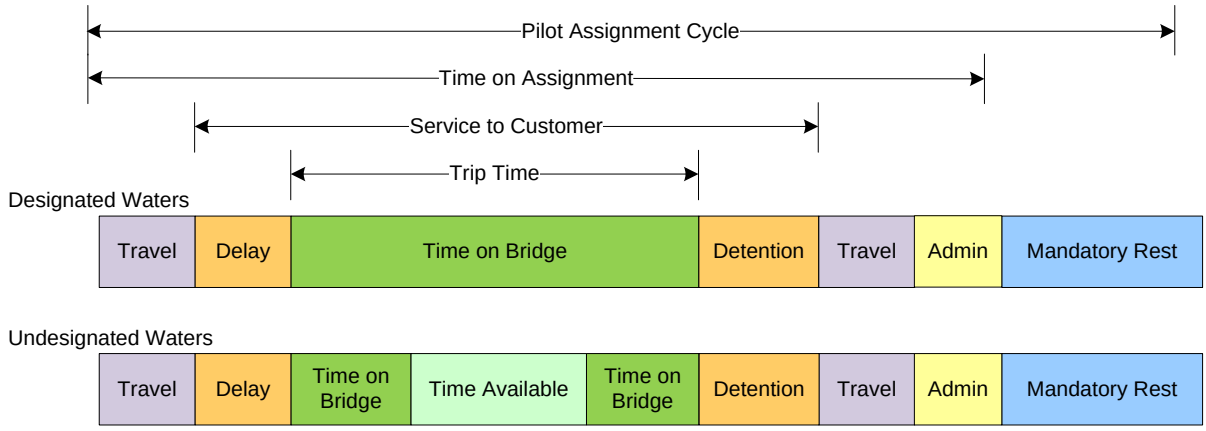

Figure 9: Recommended Pilot Activity Terminology

A method for determining a seasonal work standard takes into account all activities that are necessary and reasonable to provide pilotage services. The standard should account for adequate scheduling efficiency, rest, and scheduled time off. Because the operations in each Area vary, the seasonal work standard should vary for each Area. The standard should also vary with changes to the distribution of traffic and rate at which pilot capacity is being consumed. The Klein system can be used as the authoritative source for operational data to determine changes to pilot activities.

To demonstrate the application of these terms in determining an expected level of effort for each pilot assignment cycle, information from the Klein system was used to calculate an average Pilot

Assignment Cycle for each Area, as shown in **Table 5: Example Average Pilot Assignment Cycle for Each Area.**

Table 5: Example Average Pilot Assignment Cycle for Each Area

		Trip Time[6] (hrs)	Travel (hrs)	Delay (hrs)	Admin (hrs)	Total Time on Assignment (hrs)	Mandatory Rest (hrs)[7]	Pilot Assignment Cycle (hrs)
D1	**Area 1**	7.7[8]	3.2	0.7	0.5	12.1	13	**25.1**
	Area 2	10.4	4.6	0.9	0.5	16.4	13	**29.4**
	Area 3	***Welland Canal Exclusive to Canadian Pilots***						
D2	**Area 4**	11.1	4.6	0.7	0.5	16.9	13	**29.9**
	Area 5	6.1	3.2	0.4	0.5	10.2	13	**23.2**
D3	**Area 6**	22.5	2.4	1.0	0.5	26.4	13	**39.4**
	Area 7	7.1	3.6	0.3	0.5	11.5	13	**24.5**
	Area 8	21.6	3.7	3.3	0.5	29.1	13	**42.1**

This table presents the expected consumption of pilot capacity for each assignment within each area. Estimating the length of a season to be 280 days with 70 days of scheduled time off within the season, the maximum number of assignments a pilot can complete within a season can be determined. It is unreasonable to assume that pilots can work the maximum number of assignments:

- Ship schedules are not arranged to maximize pilot capacity; and
- Pilot schedules and availability need to minimize ship delays.

To address ship scheduling as well as compensate for pilot fatigue issues, a pilot utilization factor is applied to the maximum assignments. Long-term fatigue is addressed through seasonal breaks and scheduled time off each month during the season. 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 application of a pilot utilization factor to the maximum number of assignments compensates for:

- The inability for ships to be scheduled so that a ship is waiting immediately upon a pilot coming off of a pilot assignment cycle (this would cause delays for shipping).
- Pilot availability for surge traffic balanced with the cost of excess pilots.
- Capacity to execute movages.
- Capacity for pilot sustainment training scheduled during the piloting season.

[6] Only those assignments that can be planned or projected are accounted for. Assignments within the tariff card generate revenue. Movages are not included in determining an average assignment because of their variability in requiring mandatory rest and are considered supplemental revenue-generating mechanisms.

[7] 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.

[8] Working 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 transits between Cape Vincent and Snell Lock.

- Unplanned absences.
- Capacity for recuperative rest for multiple sequential night assignments (to combat short-term fatigue.
- Association administrative duties (e.g., piloting information updates, drills, meetings, professional development).

An example using a 50% pilot utilization factor is provided in **Table 6: Example Seasonal Work Standard** to estimate the number of assignments and amount of time a pilot is working during the season**.** A 280-day season with 70 days of scheduled time off[9] provides 210 days (or 5,040 hours) for pilot assignment. This is divided by the Pilot Assignment Cycle to obtain the Maximum Assignments in a season. The maximum 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 5: Example Average Pilot Assignment Cycle for Each Area.** The Expected Time on Assignment is the total time the pilot is "working" (engaged in pilot activities) during the 280-day season.

Table 6: Example Seasonal Work Standard

		Maximum Assignments in a Season	Maximum Time on Assignment (hrs)	Maximum Time in Pilot Assignment Cycle (hrs)	Expected Assignments (50% Eff.)	Expected Time on Assignment (hrs)
D1	Area 1	**201**	2,422	5,035	**102**	1,178
	Area 2	**171**	2,797	5,020	**87**	1,381
	Area 3	***Welland Canal Exclusive to Canadian Pilots***				
D2	Area 4	**168**	2,843	5,027	**84**	1,413
	Area 5	**217**	2,217	5,038	**107**	1,116
D3	Area 6	**127**	3,354	5,005	**62**	1,684
	Area 7	**205**	2,355	5,020	**102**	1,174
	Area 8	**119**	3,466	5,013	**57**	1,763

2.1.2 Staffing Levels

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

- **Projection of demand.** Projection of future demand in bridge hours has been historically based on from previous year's ratemaking projections, resulting in any errors being carried forward.
- **Responding to surge traffic.** Starting from the seasonal work standards discussed in the previous section, an approach to estimating the number of pilots based on historical surge traffic is presented.

[9] An assumed 10 days off per month for seven months.

2.1.2.1 Projecting Demand

The projected demand has been significantly greater than the experienced demand, which has a compounding effect on the ability to generate required revenue – tariffs are set lower because of projected higher demand, and revenue generated is lower because expected demand is not reached. A high projected demand also increases the estimate for the number of pilots, increases the cost, and further widens a revenue gap. Lowering the projected demand results in fewer pilots and increases the risk of delays while simultaneously increasing the rates.

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.

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 is applied to the previous year's projection. This results in projections based on previous projections and not on actual circumstances. Any error in the previous year's projected demand are carried forward into the next projection.

2.1.2.2 Estimating the Number of Pilots

The number of pilots establishes the capacity to meet projected demand and surge traffic within a reasonable seasonal work standard. Sufficient number of pilots on the Tour de Role limit the need to recall pilots from scheduled days off during surge traffic periods. Recalling pilots from scheduled time off impacts their quality of life. A balance must be struck between how often pilots are recalled from scheduled days off during surge traffic periods and having too many pilots on the Tour de Role during low-traffic periods. The 50% pilot utilization factor identified in **Section 2.1.1** is based on the average Pilot Assignment Cycle, taking into account all activities reasonable and necessary to provide pilotage services, ship scheduling efficiency, and addressing cumulative short-term fatigue for pilots.

Statistically approximating surge traffic patterns based on data in the Klein system allows for calculations to estimate how many pilots are necessary to respond to surge traffic an acceptable percentage of the time without having to recall pilots. This acceptable percentage establishes a threshold. Monitoring the frequency pilots are recalled from scheduled days off and delays experienced by shipping provides an indicator of whether the threshold should be changed – increased if there are more recall/delays or decreased if fewer. A more detailed discussion including methodologies and example calculations for adjusting the staffing levels based on statistically representing experienced surge traffic is provided in **Appendix B.3.**

2.1.3 System Risk Assessment

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 delays to shipping caused by pilot availability. These measures are not sufficient to provide visibility of potential risks within the system that do not result in an incident or delay. These risks are being masked by the actions and decisions of pilots to respond to the needs of industry.

Key risks identified include:

- Long assignments with sporadic or brief rest periods that may not be aligned with the pilot's sleep cycle, increasing fatigue and risking the safe navigation of the ship.
- Abbreviated mandatory rest periods to avoid delays, increasing fatigue and risking the safe navigation of the ship.
- Extended overland travel by pilots, especially after long assignments, risking pilot safety.
- Detention of pilots for convenience to the ship, consuming pilot capacity and increasing the risk of delay or compounding the first two risks identified.

2.2 Net Revenue

Net revenue is the difference between revenue required and revenue generated. The ratemaking process estimates the revenue required based on operating expenses, compensation, and a return on investment. The rate multiplier is set within the ratemaking process to balance projected revenue to the required revenue. At the conclusion of the season, the difference between the revenue required and the revenue generated is the net revenue – a gap if generated revenue is lower than required revenue and a surplus if higher.

A revenue gap has been experienced in the past leading to uncertainty of pilot compensation because operating expenses must be covered. For example, the revenue gap for 2011 is provided in **Table 7: 2011 Revenue Gap** where the net revenue gap is 27.6% of projected revenue.

Table 7: 2011 Revenue Gap

		2011 FR Projected Revenue	2011 Reported Revenues (Estimated by Area)	Net Revenue (Gap)
D1	Area 1	$2,348,516	$1,981,302	($367,214)
	Area 2	$1,689,246	$1,459,963	($229,283)
D2	Area 4	$1,436,140	$1,138,214	($297,926)
	Area 5	$2,649,876	$1,707,321	($942,555)
D3	Area 6	$2,311,006	$2,062,238	($248,768)
	Area 7	$1,614,974	$763,791	($851,183)
	Area 8	$1,904,237	$992,928	($911,309)
Totals		**$13,953,995**	**$10,105,757**	**($3,848,238)**

Closing the revenue gap will discourage practices aimed at achieving the target compensation rate that increase risks to safety and delays. In order to close the revenue gap, parameters used to estimate revenue required and projection of revenues generated must be aligned and made more accurate and stable. The recent GLPAC recommendation to increase the 1.0 weighting factor to 1.15 will contribute to closing the revenue gap. The change is estimated to increase revenue generated by 6%. Reducing or eliminating the revenue gap will mitigate many of the practices

contributing to increased risks. The revenue gap adversely impacts investments in infrastructure, new technologies, and training and the ability to attract and sustain a highly qualified pilot pool.

To monitor and provide more visibility into the revenue gap, audits of pilot association revenues should be conducted in a similar manner and frequency to audits of operating expenses currently performed.

2.2.1 Projected Demand

Errors in projection of demand and use of projected demand for cross-purposes within the ratemaking process have been the leading contributors to the revenue gap experienced. A demand projection that is too high compounds the revenue gap in two ways:

- They decrease the rates (a lower rate per hour).
- Experienced demand is lower, so the ability to generate target revenue is lower.

Recent history is the closest indicator of future demand given the dynamic nature of shipping in the Great Lakes. A projection of demand based on a historical average of experienced demand increases the objectivity and stability of the projection.

2.2.2 Billing Scheme and Baselining the Tariff Card

The billing scheme is the method by which pilot fees are charged for services provided by pilots onboard vessels transiting through the Great Lakes Region. There are two components associated with the billing scheme:

- How fees are structured. Currently, a mix of time and point-to-point billing methods makes it difficult to project revenue generated given an assumed demand. A consistent unit of measure (assignments) should be used across all calculations.
- Amount charged. Ensuring the fees are sufficient to recover the required revenue (assuming projected demand is realized).

The current ratemaking methodology only has a loose coupling between the revenue generated and the revenue produced. A ratio between the revenue required and the revenue projected to be generated scales the rates from the previous year through the application of the rate multiplier. The projected revenue is based on a tariff card with rates that are currently not associated with the distribution in volume of traffic, ship weighting factors, or pilot capacity consumed. The revenue projected to be generated is based on estimates from the previous year.

The existing process of applying a rate multiplier to the existing tariffs is another example of estimates being applied to previous estimates, carrying forward any errors in the current tariff structure or rate. The traffic distribution of volume and ship weighting factors varies over time and impacts the amount of revenue generated. The tariff card should be re-baselined, at a minimum, every three years so that the information used in estimating the projected revenue more accurately reflects the distribution of traffic. The process of re-baselining the tariff card will also recalculate the average transit times and influence the length of the pilot assignment cycle used to determine pilot capacity.

Incorporating the revenue required in this process addresses the revenue gap by baselining tariffs so that the tariffs generate the revenue required provided demand is as expected. An analysis

was performed using 2011 Klein system data to determine demand and average hourly revenue generated. Those parameters were replaced within the 2013 Final Rule to determine revised rate multipliers. When the revised rate multipliers were applied to the 2012 rates and those rates were assessed against the 2011 traffic distribution and density, sufficient revenue was generated.

A less significant matter is the current maximum charge for a 24-hour period for delay or detention is equivalent to only 15.6 hours. In essence, 8.4 hours of pilot capacity is being consumed with no revenue being generated.

A more detailed discussion on structuring the tariff card to compensate for ship traffic distribution and density and setting tariff rates to generate the revenue required is provided in **Appendix B.4.**

2.2.3 Time-Value of Expenses

In *Step 1.C: Adjustment for Inflation or Deflation* of the current ratemaking process, an inflation factor is applied to recognized expenses. This inflation factor, as currently applied, only accounts for a single year of inflation with expenses. Audit information received on expenses is typically lagging by two years or more.

As an example, the ratemaking process published for 2013 rates used the audited expense information from 2010. 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 to estimate expenses at the 2013 level.

2.3 Ratemaking Benchmarks

Several of the inputs to the ratemaking methodology are highly sensitive and subjective, with minor variations causing large changes in the final rate. Variations in these sensitive inputs also result in rate fluctuations, reducing industry's ability to plan and budget.

Establishing benchmarks increases the objectivity and reduces the volatility of these parameters. When a benchmark is not available annually, a benchmarked escalation factor should be applied for each year not available to retain objectivity.

2.3.1 Target Rate of Return on Investment (ROI)

The goal of the target rate of return is to "determine a market equivalent ROI 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. The current methodology in *Step 6: Adjustment Determination* infers that the calculation is managing a reasonable operating profit for the association. This ambiguity should be removed.

The current benchmark is Moody's Seasoned Aaa Corporate Bond Yield indicator. This rate of return provides a slightly higher rate of return when compared to other public investments with low-risk, medium-term liquidity.

The ROI is intended to promote investment in infrastructure, new technologies, and training. The limited investment base ROI is applied to does not provide sufficient motivation. In a revenue gap situation, covering the ROI comes at the expense of lowering pilot compensation

further reducing the motivation for investment. By addressing the revenue gap, the risk on investments is completely removed and motivation for investment is increased. Further increasing the motivation for investment and providing capital for investment is discussed in **Section 2.5.3**.

2.3.2 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).

An attempt to identify comparisons between the Great Lakes pilotage environment and 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 two 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

Comparative benchmarks were identified and provided in **Table 8: Comparison of Alternative Compensation Benchmarks**. While some benchmarks are expressed in terms of total compensation without distinguishing between wages and benefits, others are presented in terms of just wages where an estimate for benefits is determined.

Table 8: Comparison of Alternative Compensation Benchmarks

	2013 NPRM AMO Weighted Average	2013 FR AMO Weighted Average	Alt 2 2013 Canadian GLPA	Alt 3 2013 Federal Pilot	Proposed Between Pilots and Industry
Wages				$181,419[1]	Specific values to be discussed & proposed
Benefits				$73,026[2]	
Compensation	$246,287	$183,625	$233,157[3]	$254,445	

Table Notes:

[1] Based on 2011 published wage adjusted for 1.6% Employment Cost Index (ECI) for 2011 and 1.2% ECI for 2012.

[2] Based on 28.7% total benefits as a percentage of total compensation for private industry, company size 50–99 from http://www.bls.gov/ncs/data.htm.

[3] 2011 GLPA average adjusted for 1.6% ECI for 2011, 1.2% ECI for 2012, and 0.97 U.S./CAN dollar ratio.

2.3.3 Inflationary Factor

The current rate of inflation is determined from the Consumer Price Index All Urban Consumers (CPI-U) for the overall Midwest Region of the United States and has not been expressed as an issue. The need for applying the inflation factor for multiple years is discussed in **Section 2.2.3.**

2.3.4 Great Lakes Economic Forecast

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.[10] Sources of nationwide economic forecast indicators are also available.[11] 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 is influenced predominantly by the inclusion of the two years' previous historical traffic.

2.4 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 the current ratemaking process to promote investments in proficiency.

2.4.1 Structured Training Programs

Training supports the sustainment of qualifications and pilot proficiency. It provides opportunities to be exposed to best practices and the application of evolving technology to increase efficiency and reduce risks.

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

[11] 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.

Training is an allowable operating expense, but the delay in reimbursement, time-value of money, and revenue gap do not promote the incurred expense. The current ROI process only addresses infrastructure investments, not training.

Most recurring training can be conducted during the off-season. The pilot utilization factor discussed in **Section 2.1.1** allows for limited training during the season.

2.4.2 Recruitment and Retention

Concern is growing regarding the available candidate pool to replace pilots who will soon be retiring. Competition with other pilotage services for recruitment and increased incentives to retain captains in the Great Lakes Carriers Association is making it difficult to find qualified and experienced pilot candidates. It was reported that the quality of applicants to Great Lakes pilot positions has decreased. Hiring perspective pilots without Great Lakes experience lengthens the training period, increases costs, and impacts pilot capacity. Although pay is reported as a leading issue, other significant issues including stability of pay, a mismatch in working expectations, quality of life, and living standards.

2.5 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 and foreign vessels drive the 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.

The following sections discuss governance structures to increase the transparency and clarity of the overall ratemaking process and improving investment in infrastructure, new technology and training. The governance structures assist in the management of the ratemaking methodology.

2.5.1 Association Working Rules

The working rules for each association reflect how they plan to meet the requirements of the regulations and achieve the goals of providing safe, efficient, and cost-effective pilotage services. The working rules outline the operational requirements and safety guidance that each association will follow, as well as establish expectations on the efficiency of providing pilotage services. They provide visibility into rules governing pilot operations and dispatch.

Pilot working rules have evolved and adapted to better fit the current operations on the Great Lakes and provide efficient pilotage services to industry. The working rules for the pilot associations need to be updated to reflect these modifications and expanded to be more complete. A collection of assumptions regarding pilot rest, travel, and time off were necessary to compensate for the many assertions that were made regarding working rules but not reflected in documentation or the data that was analyzed. 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.

Because the working rules are reviewed and accepted by the Director, many of the issues expressed by stakeholders can be addressed immediately through up-to-date working rules.

2.5.2 Ratemaking Governance and Review Process

The current ratemaking process is initiated by the Coast Guard providing estimates that balance revenue required to revenue generated through a systematic process. Adjustments to the process are permitted at the discretion of the Director. A preliminary ruling is provided to the public for comment. The Coast Guard then provides a final rule in response to the comments.

The GLPAC provides recommendations based upon discussion between pilot and industry representatives. Interactions within this process are limited and parochial and typically based on a response to a ruling rather than participation in the actual rule.

This approach is frequently contentious and makes achieving consensus among stakeholders challenging. A more collaborative and involved approach to the process will significantly increase the understanding and transparency of the process. Involvement by stakeholders early in the process reduces the role of the Coast Guard to resolving unsettled conflicts rather than being in a position of creating the conflict.

Similar to how rates are set for state pilot associations in Delaware, New York, and Alabama, a dual-layered recommendation and approval process should be considered for implementation. This will increase stakeholder interaction in developing proposed rate modifications. Modifications to rates, staffing standards, or compensation levels are initiated from the stakeholders and informally discussed among themselves before entering into a formal approval process. These discussions would be nonbinding and be carried out in a forum free from regulatory oversight. Because of the initial vetting of the proposal by the stakeholders, GLPAC will have more insights into the issues presented and be able to provide a more informed and timely recommendation to the Coast Guard. The Coast Guard would still retain the formal review, approval, and adjudication process.

This approach, depicted in **Figure 10: Example Ratemaking Process Responsibilities,** opens communications among stakeholders and improves transparency and understanding of the process.

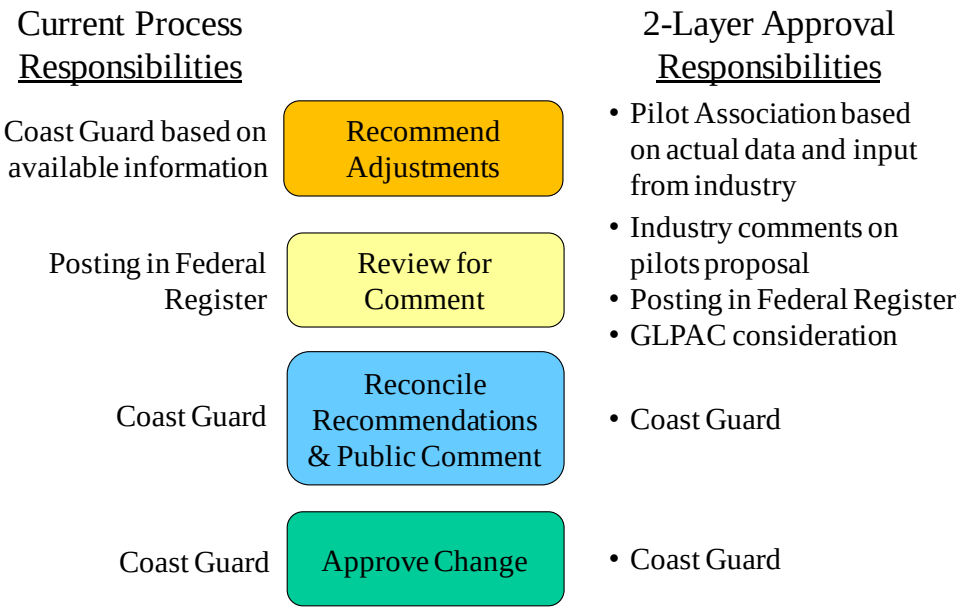

Figure 10: Example Ratemaking Process Responsibilities

2.5.3 Business Risk Reserve

Motivation for investment in infrastructure, new technologies, and training is currently limited to the ROI pilot associations receive on their recognized capital investments. This small amount of return does not provide sufficient capital or motivation for associations to make investments. The value of the ROI is also eroded by the application of only a single year's inflationary factor.

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 current ratemaking process establishes rates so that the estimated revenue required can be exactly generated if demand is as expected. There is no component to reflect the variability in demand and the risk to business in anticipating and responding to that demand. This places all of the risk in not reaching demand on the pilots. This risk should be shared between pilots and industry. Pilots could reduce their numbers to reduce the impact on compensation but this would increase the risk of delays to industry and safety of the system. Not realizing projected demand is a risk that should be shared among stakeholders.

The Business Risk Reserve can be included as an additional expense reflected in the rates. It is a designated percentage of both operating expenses and pilot compensation; not just the investment base. Because expenses are inclusive, the Business Risk Reserve would replace the ROI as shown in **Figure 11: Business Risk Reserve**. The Business Risk Reserve provides a buffer against excessively low demand to reduce the loss experienced by the association. When projected demand is not realized, reduction in the Business Risk Reserve can be realized before impacting pilot wages. It will also provide a mechanism for associations to set aside funds when projected demand is reached or exceeded.

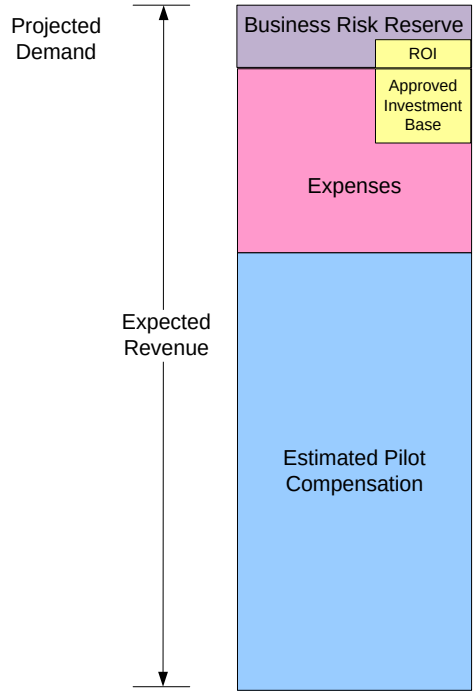

Figure 11: Business Risk Reserve

3. RECOMMENDATIONS

A collection of recommended adjustments to address each of the five areas identified in Chapter 2 is summarized in this section. These adjustments provide a more-objective ratemaking system based on available data (both performance and operational) and benefit the stakeholders as summarized in **Table 9: Stakeholder Benefits.** Clearly identified benchmarks increase the transparency and consistency of the ratemaking process. 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.

Table 9: Stakeholder Benefits

U.S. Coast Guard/Public Interest	Industry	Pilots
• Reduce Systemic Risk • Increase Transparency • Clarify the Ratemaking Process	• 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

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

The recommended adjustments of this study are summarized and presented in the five areas identified in **Section 2: Issues and Findings**. Additional discussion on these recommendations and their impact on the ratemaking methodology is provided in **Appendix B**.

3.1 Address System Implications

A collection of recommendations take into consideration the interdependency of parameters within the ratemaking process and address the issues outlined in **Section 2.1.** Adjusting a single parameter can cause imbalance between revenue required and revenue generated:

- **Seasonal Work Standard.** Base the seasonal work standard on "assignments" and an analysis of historical activities necessary and reasonable within a Pilot Assignment Cycle: travel (including pilot boat transit), delays/detentions, mandatory rest, and scheduled time off. Because the operations in each Area vary, the seasonal work standard also varies for each Area. A recalculation of average activities should be conducted every three years based on information within the Klein system (**Section 2.1.1**).
- **Demand Projection.** Project demand based on historical data rather than previous projections. Use a three-year hybrid historical average to balance historical demand (two years) with projected demand for the upcoming year. The addition of a single projected growth value in the average allows for compensation of exceptional circumstances. Stipulate demand in terms of assignments to provide a more direct relationship between demand, revenue required, pilot capacity, and the tariffs charged (**Section 2.1.2.1**).
- **Staffing Levels.** Provide an objective means for estimating the number of pilots necessary to meet surge traffic by statistically estimating the distribution of surge traffic based on the most

recent complete set of data and then scaled by the ratio of experienced demand of the dataset and projected demand for the upcoming ratemaking year. Establish an acceptable threshold on how often the traffic demand within a day statistically exceeds the number of pilots on the Tour de Role. Carry out discussions between pilots and industry on an acceptable threshold balancing the cost of delays and the expected pilot recall (**Section 2.1.2.2**).

- **System Risk Assessment.** Conduct a full system risk assessment (**Section 2.1.3**).

As an example, **Table 10: Example Impact on Revenue Required Applying System Implication Recommended Alternatives** 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. The staffing level is then adjusted to have a sufficient number of pilots on the Tour de Role to respond to 90% of the occurrences of surge traffic without the need to recall a pilot from scheduled time off. The parameters within the 2013 Final Rule are provided for comparison.

Table 10: Example Impact on Revenue Required Applying System Implication Recommended Alternatives

		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	84	677	629	$1,952,054	$2,169,960
	Area 2	5	7	173	71	530	451	$1,302,166	$1,619,555
	Total:	**11**	**14**			**1,207**	**1,080**	**$3,254,220**	**$3,789,515**
D2	Area 4	4	5	162	72	614	330	$1,185,096	$1,343,791
	Area 5	6	6	163	93	836	562	$2,144,112	$2,144,112
	Total:	**10**	**11**			**1,450**	**892**	**$3,329,208**	**$3,487,903**
D3	Area 6	7	7	80	59	507	427	$1,907,881	$1,907,881
	Area 7	4	3	140	96	454	223	$1,254,936	$1,037,030
	Area 8	6	4	83	55	442	206	$1,460,433	$1,143,047
	Total:	**17**	**14**			**1,403**	**856**	**$4,623,250**	**$4,087,957**
		38	**39**			**4,060**	**2,828**	**$11,206,678**	**$11,365,375**

In this example, the net result of having sufficient pilots to respond to surge traffic is an overall increase of one pilot across all Districts. This is the contributing factor to the overall increase in revenue required. A comparison to the seasonal work standard is made by converting the 1,000/1,800 bridge hour standard by dividing the projected Bridge Hours from the 2013 Final Rule by the average trip time in **Table 5: Example Average Pilot Assignment Cycle for Each Area.** The projected demand from the 2013 Final Rule is also converted to provide a comparison to demand generated through the application of a three-year hybrid historical average. Variances in the projected demand exceed 50%.

3.2 Close the Revenue Gap

The revenue gap (the gap between actual revenue generated and the projected revenue) has been the leading contributor to risk and stability of pilotage. Several factors in the current ratemaking process directly contribute to this imbalance of revenue required and revenue generated, mostly as a result of making projections based on the previous year's projection. 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. 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 (**Section 2.1.2.1**).
- Restructure the tariff card. Establish a set of standard point-to-point 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 and should not be differentiated between undesignated and designated waters. If a ship exceeds the standard time for convenience of the ship, additional hours will be assessed at the average hourly rate for that transit plus a recommended 50%. There would be no additional charge for exceeding the standard transit time caused by ice, weather, or traffic. Do not set a maximum charge for a 24-hour period of delay or detention (**Section 2.2.2**).
- Baseline the tariff card (**Section 2.2.2**). Baseline the tariff card on a regular basis to ensure the rates are reflective of the traffic density and distribution. Using a baselined tariff card in the ratemaking process will balance revenue required with revenue generated. A notional methodology for baselining the tariff card is presented in **Appendix B.4.2.**
- Apply multiple years of inflation. Apply an inflationary factor for each year from the year the audits were taken to the year of ratemaking (**Section 2.2.3**).

An example application of the recommended adjustments that influence the revenue projected will be presented in **Section 3.6** in the example baselined tariff card. The baselined tariff card will take into consideration the projected demand and scale the experienced traffic density and distribution from 2011 statistics from the Klein system.

To demonstrate the impact on the revenue required, **Table 11: Example Impact on Revenue Required Adjusting for Inflation** illustrates the incremental change in revenue required when applying the CPI-U for the overall Midwest Region of the United States for 2012 and projecting 2013 as the average of the past three years (2012, 2011, and 2010). These additional inflationary factors are applied to operating expenses only.

Table 11: Example Impact on Revenue Required Adjusting for Inflation

		2013 FR Ratemaking Total Revenue Required	Example 2012 Inflation Adjustment (CPI 1.8%)	Example 2013 Inflation Adjustment (3-yr Average CPI 2.1%)	2013 Revised Revenue Required
D1	**Area 1**	$1,952,054	$10,173	$12,082	$1,974,309
	Area 2	$1,302,166	$8,029	$9,535	$1,319,730
	Total:	**$3,254,220**	**$18,201**	**$21,617**	**$3,294,039**
D2	**Area 4**	$1,185,096	$10,075	$11,966	$1,207,137
	Area 5	$2,144,112	$15,113	$17,949	$2,177,173
	Total:	**$3,329,208**	**$25,188**	**$29,915**	**$3,384,310**
D3	**Area 6**	$1,907,881	$13,577	$16,124	$1,937,582
	Area 7	$1,254,936	$6,529	$7,755	$1,269,220
	Area 8	$1,460,433	$8,658	$10,283	$1,479,374
	Total:	**$4,623,250**	**$28,764**	**$34,162**	**$4,686,176**
		$11,206,678	**$72,153**	**$85,694**	**$11,364,525**

3.3 Establish Ratemaking Benchmarks

Establishing benchmarks increases the objectivity of the process. These benchmarks provide comparative insight and support the application of judgment in the current process. Recommended benchmarks in the ratemaking process are:

- Pilot Compensation. Pilots and industry discuss a reasonable level of compensation and the impact on pilotage rates (**Section 2.3.2**), using:
  - A single compensation rate for both undesignated and designated waters. A baseline of the AMO union contracts and comparison to federal pilot compensation and GLPA compensation levels support the discussion.
  - The Employment Cost Index (ECI) for private industry, company size 50–99 employees, to estimate percentage of benefits in total compensation.
  - The ECI for occupational group "management, professionals, and related occupations" to escalate wages and compensation for years the federal pilot compensation rate is not available.
- Inflation on operating expenses. Continue the use of the CPI-U for the overall Midwest Region of the United States. For the partial year during the ratemaking process, apply most recently published monthly figures. To project inflation into the ratemaking year, take an average over the past three years (**Section 2.2.3**).
- Economic growth projection. Use the Chase Bank State of the Midwest Economy, which estimates economic growth on the Great Lakes, as a basis for projecting one year when calculating the three-year hybrid historical average (**Section 2.3.4**).

3.4 Sustain Pilot Proficiency

Establishing a structured training program and having an effective recruitment and retention program sustains the proficiency of pilots, supporting continued and enhanced safety of pilotage services.

- Establish a training program (**Section 2.4.1**). Establish guidance on training programs, and publish it in the association working rules. Consideration for shared expense between the pilots and recouped from industry should be reflected in those rules. Recommended recurring training courses include:
  - Bridge Simulator Training (or an equivalent manned model training)
  - Rapid Radar Plotting
  - Electronic Navigation
  - Standards of Training, Certification and Watchkeeping (STCW)
  - Bridge Resource Management
  - Legal Aspects of Piloting
- Review recruitment and retention. Conduct an evaluation of recruitment and retention issues (**Section 2.4.2**) to include:
  - Incentives to attract new pilots.
  - Incentives to retain existing pilots.
  - Adequacy of Coast Guard standards to ensure qualified pilots and filter out less-qualified pilots to manage the necessary training/qualification periods.

3.5 Improve System Management

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

- Review and update Pilot Association Working Rules (**Section 2.5.1**) to increase consistency and completeness. Specify in the association working rules the number of scheduled days off and under what circumstances a pilot can be recalled. Document rules for assessing an additional charge to industry for recalling a pilot from scheduled time off and additional compensation to the pilot for being recalled (**Section 2.1.2.2**). A listing of specific adjustments to the pilot association rules is provided in **Appendix B.11.1.**
- Adjust the current ratemaking development and review process to a two-stage approach with recommended modifications to rates initiated by the pilots (**Section 2.5.2**):
  - Any recommendations to modify the output of the methodology are put forth by the pilots, developed from discussions among the stakeholders (both U.S. and Canada); that recommendation is endorsed (either positive or negative) by industry, and GLPAC provides a recommendation.
  - Final review and approval is provided by the Coast Guard.
- Publish annual statistics. Pilot associations publish annual statistics, similar to those presented in the GLPA Annual Reports, to increase the transparency of the process (e.g., expense and revenue summary, assignment statistics; performance measures [delays, groundings, etc.], compensation).
- Incorporate a Business Risk Reserve into the revenue required. Replace the current ROI with a Business Risk Reserve. Base the Business Risk Reserve on estimated expenses and pilot

compensation applying Moody's Seasoned Aaa Corporate Bond Yield. Audit revenue generated by the associations in a similar manner expenses are currently audited to monitor the rate of the Business Risk Reserve (**Section 2.5.3**).

- Enhance available information in the Klein system to increase the system's objectivity. Specific recommendations are listed in **Appendix B.11.5**.

3.6 Overall Impact on Rates

This section provides insight into the impact on rates when applying a collection of recommended adjustments spanning all of the areas identified. Changes to the revenue required are a result of several recommendations:

- Use of a single pilot compensation rate will increase revenue required in undesignated waters and decrease it in designated waters.
- Estimating staffing levels to respond to surge traffic without having to recall pilots results in a net increase of one pilot overall:
  - One additional pilot in Area 1 and Area 4
  - Two additional pilots in Area 2
  - One fewer pilot in Area 7.
  - Two fewer pilots in Area 8.
- Applying multiple years of inflation to account for the time-value of expenses slightly increases required revenue.
- Incorporating a Business Risk Reserve increases required revenue.

An example of the net impact of these adjustments on the revenue required is summarized in **Table 12: Example Impact on Revenue Required across All Recommended Adjustments.** An overall system net increase of 8.5% to revenue required is the result of apply all of the above recommended adjustments

Table 12: Example Impact on Revenue Required across All Recommended Adjustments

		Area Revenue Required 8/1/2012 2013 NPRM	2013 Revised Revenue Required	% Change
D1	**Area 1**	$2,404,424	$2,512,075	4.5%
	Area 2	$1,569,160	$2,375,374	51.4%
	Total:	**$3,973,584**	**$4,887,449**	**23.0%**
D2	**Area 4**	$1,398,694	$1,915,832	37.0%
	Area 5	$2,596,484	$2,474,372	-4.7%
	Total:	**$3,995,178**	**$4,390,204**	**9.9%**
D3	**Area 6**	$2,281,673	$2,684,089	17.6%
	Area 7	$1,556,517	$1,193,274	-23.3%
	Area 8	$1,780,829	$1,588,139	-10.8%
	Total:	**$5,619,019**	**$5,465,502**	**-2.7%**
		$13,587,781	**$14,743,155**	**8.5%**

An example baselined tariff card to generate revenue equal to the revenue required is presented in **Table 13: Example 2013 Baselined Tariff Card to Generate Revenue Required.** A comparison to the same service applying the rates from the 2013 Final Rule is provided.

Table 13: Example 2013 Baselined Tariff Card to Generate Revenue Required

Transit Definition	2013 FR Rates	Proposed 2013 Rate	Percentage Increase/ Decrease
Area 1 (Designated)			
Snell & Cape Vincent	$3,984	$4,768	19.7%
Area 2 (Undesignated)			
Cape Vincent & Port Weller	$2,553	$4,381	71.6%
Cape Vincent & Western Ontario Port*	$3,365	$5,392	60.2%
Port Weller & Western Ontario Port*	$1,663	$1,685	1.3%
Western Ontario Port Change*	$2,514	$2,359	-6.2%
** Assumes one dockage when estimating 2013 FR rate*			
Area 4 (Undesignated)			
Port Colborne & Ashtabula*	$2,293	$3,388	47.8%
Port Colborne & Cleveland*	$3,121	$5,082	62.8%
Port Colborne & Erie*	$2,293	$2,372	3.4%
Port Colborne & Southeast Shoal	$2,484	$5,082	104.6%
Southeast Shoal & Ashtabula*	$2,293	$2,372	3.4%
Southeast Shoal & Cleveland*	$2,293	$2,372	3.4%
Southeast Shoal & Erie*	$2,293	$3,388	47.8%
** Assumes one dockage when estimating 2013 FR rate*			
Area 5 (Designated)			
Port Huron Change Point & Detroit River	$3,060	$4,570	49.3%
Port Huron Change Point & Detroit Pilot Boat	$2,381	$3,739	57.0%
Detroit, Windsor, or Detroit River & Southeast Shoal	$2,339	$2,493	6.6%
Detroit Pilot Boat & Southeast Shoal	$1,693	$3,324	96.3%
Toledo or any Point on Lake Erie W. of Southeast Shoal & Southeast Shoal	$2,339	$3,324	42.1%
Toledo or any Point on Lake Erie W. of Southeast Shoal & Detroit River	$3,037	$3,739	23.1%
Toledo or any Point on Lake Erie W. of Southeast Shoal & Detroit Pilot Boat	$2,339	$3,324	42.1%
Area 6 (Undesignated)			
B12 & DeTour, Cheboygan, or Mackinac	$2,073	$2,686	29.6%
B12 & Green Bay, Menominee, or Sturgeon Bay*	$6,184	$7,425	20.1%
B12 & Goderich, ON*	$2,729	$2,212	-19.0%
B12 & Little Current, ON*	$4,111	$4,266	3.8%
B12 & Milwaukee*	$5,493	$6,635	20.8%
B12 & Southern Lake Michigan*	$8,257	$9,637	16.7%
DeTour, Cheboygan, or Mackinac & Green Bay, Menominee, or Sturgeon Bay*	$4,802	$5,687	18.4%
DeTour, Cheboygan, or Mackinac & Little Current, ON*	$4,111	$7,109	15.0%
DeTour, Cheboygan, or Mackinac & Milwaukee*	$4,111	$3,950	-3.9%
DeTour, Cheboygan, or Mackinac & Southern Lake Michigan*	$4,111	$4,581	11.4%
DeTour, Cheboygan, or Mackinac & Tobermory, ON*	$2,038	$1,896	-7.0%
DeTour, Cheboygan, or Mackinac & Traverse City*	$2,038	$1,422	-30.2%
Green Bay, Menominee, or Sturgeon Bay & Southern Lake Michigan*	$4,111	$3,950	-3.9%
Goderich, ON & DeTour, Cheboygan, or Mackinac*	$2,729	$3,476	1.6%

Transit Definition	2013 FR Rates	Proposed 2013 Rate	Percentage Increase/ Decrease
Goderich, ON & Green Bay, Menominee, or Sturgeon Bay*	$4,802	$8,057	17.2%
Goderich, ON & Southern Lake Michigan*	$5,493	$6,635	20.8%
Milwaukee & Green Bay, Menominee, or Sturgeon Bay*	$4,111	$4,423	7.6%
Milwaukee & Southern Lake Michigan*	$2,729	$2,370	-13.2%
Within Southern Lake Michigan*	$1,347	$948	-29.6%
Traverse City & Southern Lake Michigan*	$3,420	$3,792	10.9%
Tobermory, ON & Little Current, ON*	$1,347	$790	-41.4%
** Assumes one dockage when estimating 2013 FR rate*			
Area 7 (Undesignated)			
Gros Cap, ON & DeTour	$2,583	$4,067	57.4%
Sault Ste. Marie, MI & Gros Cap	$973	$1,627	67.2%
Sault Ste. Marie, MI & DeTour and any point in between	$2,165	$5,287	144.2%
Area 8 (Undesignated)			
Gros Cap, ON & Duluth or Superior*	$3,487	$7,085	103.2%
Gros Cap, ON & Thunder Bay, ON*	$2,315	$4,114	77.7%
Duluth or Superior & Thunder Bay, ON*	$2,901	$5,028	73.3%
Additional Charges			
Delay, Detention, Cancellation in excess of one hour, or exceeding the Transit Standard for convenience of the ship (per hour – no maximum)			
District 1	$126	$331	163%
District 2	$126	$389	209%
District 3	$126	$208	65%
Other Charges			
Cancellation (flat rate)	$705	$0	-100%
Movage Area 1	$1,361	$681	-50%
Movage Area 2	$1,624	$1,011	-38%
Movage Area 4	$1,274	$678	-47%
Movage Area 5	N/A	$1,246	100%
Movage Area 6	$691	$1,896	174%
Movage Area 7	$973	$1627	67%
Movage Area 8	$1,114	$914	-18%

This example tariff card was baselined to the Revised Revenue Required (**Table 12: Example Impact on Revenue Required across All Recommended** Adjustments) incorporates the recent GLPAC recommended increase of the 1.0 weighting factor to 1.15. Rates were estimated to generate the 2013 Revised Revenue Required using the 2011 traffic density and distribution as recorded in the Klein system. After rates were established based on the 2011 traffic density, they were scaled by the ratio of experienced demand in 2011 to the three-year hybrid historical average projected demand in 2013.

The most significant contributing factor to rate changes on the tariff card is the difference between the projected demand in the 2013 Final Rule and the projected demand based on a three-year hybrid historical average. The difference between these two projections is as much as 50% in some Areas, which could lead to an increase in pilotage rates by as much as 100% (projected demand as the denominator in the calculation of rates).

It is recognized that adjusting the billing structure will require retraining 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.

3.7 Summation

The collection of recommended adjustments increases the objectivity, transparency, and stability of the system. Basing the calculations on objective inputs derived from actual historical data within the Klein system and identified benchmarks provides a self-correcting process that is less influenced by the application of judgment within the process.

An increase in rates is necessary to close a revenue gap that has persisted as a result of using previous years' estimates to project rates – carrying forward previous errors in those estimates. Follow-on rates should stabilize once this revenue gap is closed.

Currently available information and data was used in this study to identify, validate, and demonstrate issues and recommended adjustments. Applicable information and data will need to be updated and applied for the set of selected recommended adjustments when incorporated into a rulemaking.

This report and the recommended adjustments are to be presented to the GLPAC.

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 Rule
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 necessary and reasonable 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.

Term	Definition
Projected Revenues	The anticipated revenues from pilotage fees based on the projected demand multiplied by the Previous Year's Pilotage Rate.
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 "[a]vailable 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))

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APPENDIX B. AMPLIFYING DISCUSSION AND ASSESSMENTS

MSI was tasked to provide the following deliverables:

- A Draft Report of Findings and Recommendations presented to the Great Lakes Pilotage Advisory Committee (GLPAC) during their meeting in February 2013.
- Facilitation of focus groups and stakeholder comments on the draft report.
- An Updated Draft Report incorporating initial feedback from the focus groups.
- This Final Report incorporating feedback to be presented at the GLPAC meeting in July 2013.

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.

This appendix provides a more-detailed discussion of the topics presented in the body of the report. Each of these recommended adjustments proposes a methodology to be applied. The following topics are discussed, with key parameters influencing the ratemaking process indicated with an asterisk:

- **B.1: Clarifying Terminology** supports removing the conflicting applications of the term "bridge hour" in the ratemaking process and identifying terms that are independent of one another.*
- **B.2: Seasonal Work Standard** discusses expectations for the number of assignments for each pilot within each Area.*
- **B.3: Staffing Levels** includes a review of averaging to project demand and striking a balance with the number of pilots to respond to surge traffic to avoid delays balanced against excess capacity of pilots.*
  - B.3.1: Applying a Historically Based Average to Project Demand
  - B.3.2: Estimating the Number of Pilots
- **B.4: Billing Scheme and Baselining the Tariff Card** are reviewed to generate sufficient revenue.*
  - B.4.1: Structured Billing Scheme
  - B.4.2: Baselining the Tariff Card
- **B.5: Target Rate of Return on Investment** and its application within the ratemaking process are reveiewed.*
- **B.6: Pilot Compensation** provides comparisons to independent and publically available benchmarks for pilot compensation.*

- **B.7: System Implications** discusses system risks, including:
  - B.7.1: System Risk Assessment
  - B.7.2: Long Assignments in Area 6
  - B.7.3: Pilot Change at Iroquois Lock
- **B.8: Net Revenue** addresses the gap between the estimated revenue required and the revenue generated:
  - B.8.1: Time Value of Expenses
  - B.8.2: The Projected Revenue Calculation
  - B.8.3: Rate Multiplier Calculations
- **B.9: Ratemaking Benchmarks** provides independent, third-party factors to support estimations and projections either directly or as escalation factors when a benchmark is not available on an annual basis:
- **B.10: Sustaining Pilot Proficiency** identifies efforts in the areas of training, recruitment, and retention:
  - B.10.1: Structured Training Program
  - B.10.2: Recruitment and Retention
- **B.11: Ratemaking Management and Governance** reviews operations of running the Great Lakes pilot program:
  - B.11.1 Association Working Rules
  - B.11.2: Ratemaking Governance and Review Process
  - B.11.3: Business Risk Reserve
  - B.11.4: Shared Services
  - B.11.5: Klein System Information

For those key parameters marked with an asterisk, alternatives were evaluated against a set of criteria in the general areas of safety, efficiency, and cost of providing pilot services on the Great Lakes. Impacts on the ratemaking process itself are also evaluated. Alternatives are assessed against the criteria and assigned a positive or negative value based on the alternative's impact on the criteria. For each assessment, a risk narrative is provided to address the components of risk in that area – threat, vulnerability, and consequence. An overall comment narrative provides clarification of the evaluation. The following is a listing of the assessment category and a description of the criteria within that category.

- **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:
  - **Fatigue Standards** – Fatigue associated with the current assignment, cumulative short-term fatigue over multiple back-to-back assignments, and cumulative fatigue over the entire season.
  - **Managed Operating Risk** – Risks associated with rushing through an assignment 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 and certification programs.

- **Efficiency/Reliability** – The risk of impacting the efficiency of the system (e.g., delays or adverse movements) are 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 traffic. A sufficient amount of excess capacity is desired in order to respond to surge traffic.
  - **Efficient Movement of Vessels** – Vessels move through the system at an efficient speed; slow movers are discouraged. Practices adversely 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 and balancing industry and pilot business needs:
  - **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 are predictable and don't fluctuate dramatically from year to year.
  - **Fair Pilot Compensation** – Compensation to the pilots is accurate, comparable to other similar occupations, reflective of the cost of living in the area, and commensurate with the 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** – Risks associated with the ability for the process to inform and engage stakeholders, promote improvement, increase cooperation, and produce acceptable results:
  - **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 –** Decisions made during the ratemaking process are readily traceable to information commonly shared with all stakeholders.
  - **Clarity –** 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** – Investments in system training, new technologies, and infrastructure are encouraged, maintaining a high level of safety, increased efficiency, and managed costs.

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 Criterion	
+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) is 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 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 or conflict in application (specifically, the previously used term "Bridge Hour"). The recommended terminology is not a one-for-one replacement of terminology used in the existing ratemaking process. Rather it is a new set of terms that remove overlap that can lead to miscommunication. The scope of each term was carefully reviewed to ensure that its influence on the ratemaking process is isolated to one area.

Ambiguity on the scope of the term "Bridge Hour" started in 1995 when an adjusted definition was published in the Final Ruling: "Bridge hours are the number of hours a pilot is aboard a

vessel providing pilotage services."[12] 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 the pilot may not be on the bridge of the ship. The phrase "aboard a vessel providing pilotage services" led to the uncertainty of the inclusion of delays, detentions, and cancellations (DDC). Even though delayed or detained, the pilot still provides service onboard the vessel in terms of preparation and planning for the assignment.

Multiple and contradicting applications of the term "Bridge Hour" within the ratemaking process have caused considerable confusion:

- In Step 2.b, estimating the number of pilots (related to pilot capacity) and estimating revenue required.
- In Step 3, calculating projecting revenues generated.

These two application work against each other. A higher projected demand in Step 2.b increases the number of pilots and the revenue required. A higher projected demand in Step 3 reduces the projected revenue generated. A high projected demand has a compounding affect by raising the revenue required, reducing the rate at which revenue is generated, and causing a revenue gap when actual demand falls short of the projected demand.

Ambiguity in the term "Bridge Hour" occurs within the existing ratemaking process, with one reference to a 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 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, 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).

A second reference to the term "Bridge Hour" is its application to projecting demand in 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. This only complicates matters, with future projections needing to estimate delays and detentions as well as demand.

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 (i.e., by not including DDC in the estimation of revenue generated, the revenue gap is reduced).

A recommended adjustment is to transition from bridge hours to the number of assignments as a consistent unit of measure across the entire ratemaking process. An assignment is easier 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

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

services provided to industry. A consistent unit of measure (assignments) should be used across all calculations.

To remove ambiguity and ensure all components influencing pilot capacity and workload are accounted for within the terminology, it is recommended the terms depicted in **Figure B-1: Recommended Pilot Activity Terminology** be used. The illustration provides a breakdown of a pilot's time and supports discussions throughout the report regarding consumption of pilot capacity. "Trip Time" is being introduced to remove confusion with the term "Bridge Hour." DDC are separate components besides "Trip Time." DDC are included when discussing "Time on Assignment" and the "Pilot Assignment Cycle."

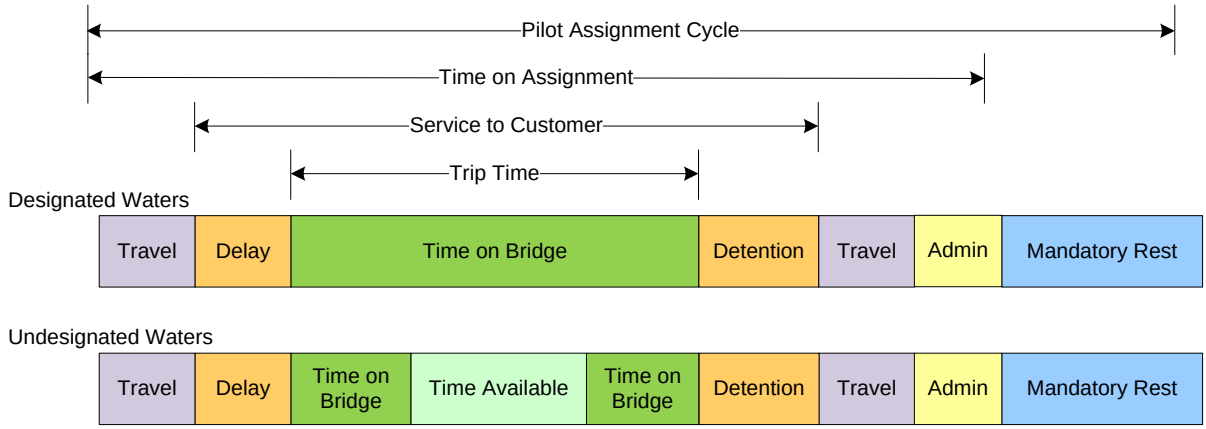

Figure B-1: Recommended Pilot Activity Terminology

The following terms are 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 working 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 required rest period at the conclusion of an assignment in accordance with association working 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 necessary and reasonable 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 working 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 Alternatives:

The evaluation within this section is only scoped to providing an alternative set of terms and definitions to clarify the ratemaking process.

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.

Alternative 2: Provide clarification and separation of terms used (**Figure B-1: Recommended Pilot Activity Terminology**).

Assessment of the terminology discussed above is provided in **Table B-2: Assessment Supporting Clarifying Terminology.** The recommended adjustment 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 of these terms on the ratemaking methodology will be addressed as they are applied in other sections of this report.

Table B-2: Assessment Supporting 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			
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	
Clarity	-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 of the ambiguity of the terms in other areas will be addressed in the appropriate section of the report.			

Recommended Adjustments:

- Adopt the clarifying terminology in **Figure B-1: Recommended Pilot Activity Terminology.**
- Transition from a unit of measure of "Bridge Hour" to "Assignment."

B.2 Seasonal Work Standard

A seasonal work standard is the reasonable 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. The difference in the standards reflects the availability of the pilot to the bridge and how much "work" a pilot in 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." Pilots may 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."

An analysis of all necessary and reasonable activities to provide pilotage services was conducted. From that analysis, it was found that there are significant issues associated with the current 1,000/1,800 Bridge Hour standard:

- The history establishing a standard provides limited basis or validation for the standard reflecting pilot capacity.
- Operations within each Area vary.
- The concept of "designated" and "undesignated" waters is a legal constraint and does not address the equal consumption of pilot capacity regardless of "designated" or "undesignated".
- In some Areas the current Bridge Hour standard hours exceed maximum pilot capacity. When taking into consideration all activities that are reasonable and necessary to provide pilotage services, the standard can only be achieved if scheduling of pilots is exactly sequential/nonstop throughout the entire season. It is unreasonable to expect pilots to obtain this maximum.

A method for determining a seasonal work standard takes into account all activities that are necessary and reasonable to provide pilotage services. The standard should account for adequate scheduling efficiency, rest, and scheduled time off. Because the operations in each Area vary, the seasonal work standard should vary for each Area. The standard should also vary with changes to the distribution of traffic and rate at which pilot capacity is being consumed. The Klein system can be used as the authoritative source for operational data to determine changes to pilot activities.

A pilot's annual capacity is broken down as shown in **Figure B-2: Pilot Annual Capacity.**

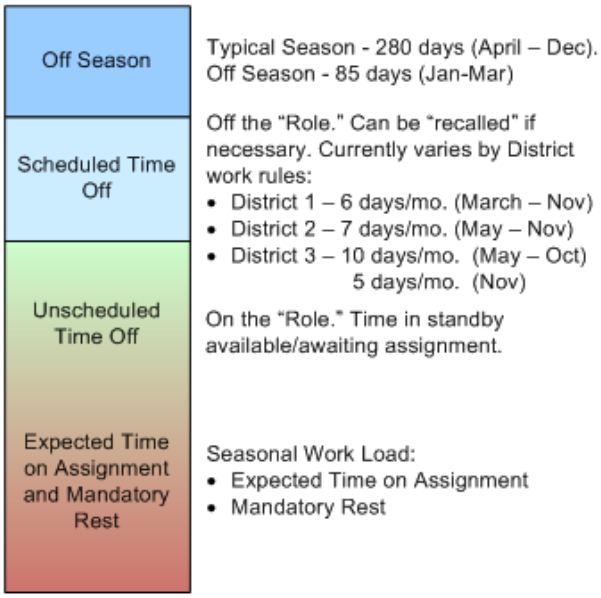

Figure B-2: Pilot Annual Capacity

As an example, an average pilot assignment cycle for each assignment was calculated from the Klein system data for each Area as shown in **Table B-3: 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 average time pilot capacity is being consumed for each assignment. Only those assignments that can be planned or projected are accounted for. Assignments within the tariff card generate revenue. Movages are not included in determining an average assignment because of their variability in requiring mandatory rest and are considered supplemental revenue-generating mechanisms.

Table B-3: 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)[13]	Pilot Assignment Cycle (hrs)
D1	**Area 1**	7.7[14]	2.9	0.3	0.7	0.5	12.1	13	**25.1**
	Area 2	10.4	4.0	0.6	0.9	0.5	16.4	13	**29.4**
	Area 3	***Welland Canal Exclusive to Canadian Pilots***							
D2	**Area 4**	11.1	4.2	0.4	0.7	0.5	16.9	13	**29.9**
	Area 5	6.1	2.3	0.9	0.4	0.5	10.2	13	**23.2**
D3	**Area 6**	22.5	1.6	0.8	1.0	0.5	26.4	13	**39.4**
	Area 7	7.1	1.4	2.2	0.3	0.5	11.5	13	**24.5**
	Area 8	21.6	1.8	1.9	3.3	0.5	29.1	13	**42.1**

[13] 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.

[14] Working 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.

Table B-3 was developed as follows:

- The Trip Time is calculated from the average trip time for trips recorded in the Klein system (does not include the average time for movages).
- Average Travel Time is derived from the total overland travel for the Area divided by the number of assignments (less movages). Travel figures are 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's home to the office is not included.[15]
- Pilot Boat Transit is the estimated average time spent on the pilot boat transiting to/from the vessel. 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 B-4: Pilot Boat Travel Times.** 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 for each assignment.

Table B-4: 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 is based on the total Delay/Detention for the Area 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 is assumed to be 30 minutes per assignment.
- After each assignment, the mandatory rest period is assumed to be consistent across the associations (13 hours), despite differences in the working rules for each association.[16] It is recommended that the mandatory rest period be made consistent across Districts as part of the process of updating the working rules.

[15] District 3 association working rules allow for 30 minutes of rest for every hour driven when the pilot drives himself. District 3 reported 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.

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

Within this example, the maximum number of assignments a pilot can complete can be determined and is shown in **Table B-5: Example Maximum Assignments in Season per Pilot.** The number of days available to the pilot was determined for a 280-day season and 70 days of scheduled time off.[17] The total hours available during the season were then divided by the Pilot Assignment Cycle to obtain the Maximum Assignments in a season.

Table B-5: 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	201	1,548	2,422	5,035	5
	Area 2	171	1,778	2,797	5,020	20
	Area 3	*Welland Canal Exclusive to Canadian Pilots*				
D2	Area 4	168	1,865	2,843	5,027	13
	Area 5	217	1,324	2,217	5,038	2
D3	Area 6	127	2,858	3,354	5,005	35
	Area 7	205	1,456	2,355	5,020	20
	Area 8	119	2,570	3,466	5,013	27

The Maximum Assignments in a Season vary by Area based on varying operating condition in each 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 B-3: Example Average Pilot Assignment Cycle for Each Area.** The "Trip Time" corresponds to the current definition of "Bridge Hour" (does not account for DDC). The maximum trip time for Areas 2 and 4 exceeds the current 1,800 bridge hour standard. The only way Areas 2 and 4 can achieve their current standard is if they are scheduled for and work the maximum assignments in a season.

It is unreasonable to assume that pilots can work the maximum number of assignments:

- Ship schedules are not arranged to maximize pilot capacity; and
- Pilot schedules and availability need to minimize ship delays.

To address ship scheduling as well as compensate for pilot fatigue issues, a pilot utilization factor is applied to the maximum assignments. Long-term fatigue is addressed through seasonal breaks and scheduled time off each month during the season. 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.

[17] 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 (10 days per month for seven months of the season) is used in these example calculations.

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 hours 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."

The application of a pilot utilization factor compensates for:

- The inability for ships to be scheduled so that a ship is waiting immediately upon a pilot coming off of a pilot assignment cycle (this would cause delays for shipping).
- Pilot availability for surge traffic balanced with the cost of excess pilots.
- Capacity for recuperative rest for multiple sequential night assignments (to combat short-term fatigue.
- Capacity to execute movages.
- Capacity for pilot sustainment training scheduled during the piloting season.
- Unplanned absences.
- Association administrative duties (e.g., piloting information updates, drills, meetings, professional development).

Alternatives for pilot utilization factor values are summarized in **Table B-6: Seasonal Work Standard Alternatives.** In order to compare to the Bridge Hour Standard in the 2013 Final Rule (FR), the current bridge hour standard was divided by the Trip Time from **Table B-3: Example Average Pilot Assignment Cycle for Each Area** to convert hours to number of trips. 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 operating characteristics reflected in varying standards rather than the two standards for designated and undesignated waters.

Table B-6: Seasonal Work Standard Alternatives

		2013 FR Ratemaking Bridge Hour Standard (Hrs)	Example 2013 Ratemaking Standard (Trips)	Alternative 1: 60% Utilization (Assignments)	Alternative 2: 50% Utilization (Assignments)	Alternative 3: 40% Utilization (Assignments)	2011 Klein Actual Average (Assignments/ pilot)
D1	**Area 1**	1,000	129	120	100	80	105
	Area 2	1,800	173	102	85	68	94
	Area 3	***Welland Canal Exclusive to Canadian Pilots***					
D2	**Area 4**	1,800	162	100	84	67	78
	Area 5	1,000	163	130	108	86	93
D3	**Area 6**	1,800	80	76	63	50	61
	Area 7	1,000	140	123	102	82	73
	Area 8	1,800	83	71	59	47	46

Assessment of Alternatives:

An assessment of the alternatives is provided in **Table B-7: Assessment Supporting Seasonal Work Standard.** The recommended adjustment is to use a 50% pilot utilization factor (Alternative 2) as an initial planning factor for pilot capacity. This will be further refined and validated in **Appendix B.3.2** when estimating staffing levels to respond to surge traffic.

Table B-7: Assessment Supporting 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 (1,000/1,800) are 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				
Ratemaking Process	2	2	2	**Risk to the Ratemaking Process**
Stability/Repeatability	0	0	0	Clear and full justification for work standards accounting for
Transparency	3	3	3	

	Alt 1	Alt 2	Alt 3	Risk Statement
Clarity	-1	-1	-1	reasonable activities to provide pilot services.
Accounts for Interdependencies	0	0	0	
Promotes Investments	0	0	0	
Overall Assessment	6	10	8	
Comment:				

Recommended Adjustments:

- Base the seasonal work standard on "assignments" and an analysis of historical activities necessary and reasonable within a Pilot Assignment Cycle: travel (including pilot boat transit), delays/detentions, mandatory rest, and scheduled time off.
- Vary the Seasonal Work Standard by Area due to varying operations within each Area.
- Recalculate average activities every three years, using the Klein system as the authoritative source for operational data.
- Make the mandatory rest period and the scheduled days off per month consistent across the Districts.

Using a 50% pilot utilization factor as an example, a calculation is carried out in **Table B-8: 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 from **Table B-3: Example Average Pilot Assignment Cycle 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.

Table B-8: 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	100	770	1,205	2,505	2,535
	Area 2	85	884	1,390	2,495	2,545
	Area 3					
D2	Area 4	84	932	1,422	2,514	2,526
	Area 5	108	659	1,104	2,508	2,532
D3	Area 6	63	1418	1,664	2,483	2,557
	Area 7	102	724	1,172	2,498	2,542
	Area 8	59	1274	1,718	2,485	2,555

B.3 Staffing Levels

Staffing levels is an estimation of the number of pilots needed to provide piloting services within each Area, accounting for surge demand.

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 staffing needs 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. District 1 (11 pilots) and District 2 (10 pilots) pilot rolls reflect the estimate in the 2013 FR, while District 3 (14 pilots in 2011) is below the 2013 Final Rule estimate of 17 pilots.

Staffing levels has two major components addressed in separate sections:

- **Projection of demand.** Projection of future demand in bridge hours has been historically based on from previous year's ratemaking projections, resulting in carrying forward any errors.
- **Responding to surge traffic.** Starting from the seasonal work standards discussed in the previous section, an approach to estimating the number of pilots based on historical surge traffic is presented.

B.3.1 Applying a Historically Based Average to Project Demand

Projected demand is the anticipated demand for pilotage service for the upcoming ratemaking year. Projected demand will be discussed here in terms of number of assignments. Using "assignments" provides a common unit of measure and a direct relationship to the capacity needed for pilots and rates charged to industry.

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.

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 is applied to the previous year's projection. This results in projections based on previous projections and not on actual circumstances. Any error in the previous year's projected demand are carried forward into the next projection.

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.

These two application work against each other. A higher projected demand in Step 2.b increases the number of pilots and the revenue required. A higher projected demand in Step 3 lowers rates

and the projected revenue generated. When actual demand falls short of the projected demand, it further compounds the revenue gap.

Assessment of Alternatives:

Applying an average dampens the variations in demand on the Great Lakes. The degree of dampening and the amount of time necessary to react to changing trends in demand are dependent on the length of the historical averaging window used. Pros and cons for each length window are provided in **Table B-9: Comparing Sliding Window Averages.**

Table B-9: 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.
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 B-3: Averaging Alternatives** reflects the four alternatives and the time span for each. This example is based on projecting demand for the 2013 season.

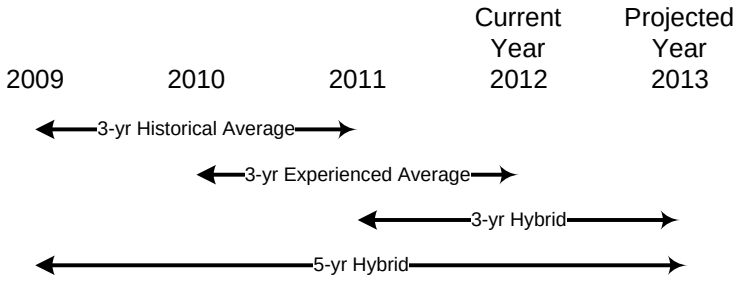

Figure B-3: Averaging Alternatives

Alternative 1: Three-year Historical Average

Historically, traffic demand in the Great Lakes is dynamic. An averaging window longer than three years will not be as responsive to these changing 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 (i.e., there is a one-year gap).

Alternative 2: Three-year Experienced Average

Three most recently available years of data are averaged, including two full years preceding the current year, and the 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 same period of time. The previous year's total demand is then increased by that estimated percentage increase/ decrease to estimate the remainder of demand for the current year.

Alternative 3: Five-year Hybrid Historical Average

The hybrid historical average provides a combination of historical demand to stabilize the projection and incorporates an anticipated adjustment to the average for the upcoming year. Incorporating this last year into the average reduces the lag of anticipated changes in demand. Included in the five-year hybrid historical average are:

- 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 year's demand based on YTD comparison to the previous year.)
- A projection for the upcoming ratemaking year. That projection is based on a percentage increase/decrease in demand over the current year. 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%. A benchmark for this projection is provided in **Appendix B.9.2**.

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 completed previous year is averaged with the YTD estimation for the current year and a projection for the following year.

A graph providing a comparison of three- and five-year historical and hybrid historical averages to the projections used in past ratemaking processes is provided in **Figure B-4: Effects of Applying Historical Averages.** To generate the projected year within they hybrid average, the preceding year was increased by 2%. For example, to calculate a three-year hybrid historical average for 2008, the actual demand for 2006 and 2007 was averaged with a 2% increase of 2007 demand. The three-year hybrid historical average provides the best tracking/response to the fluctuating demand.

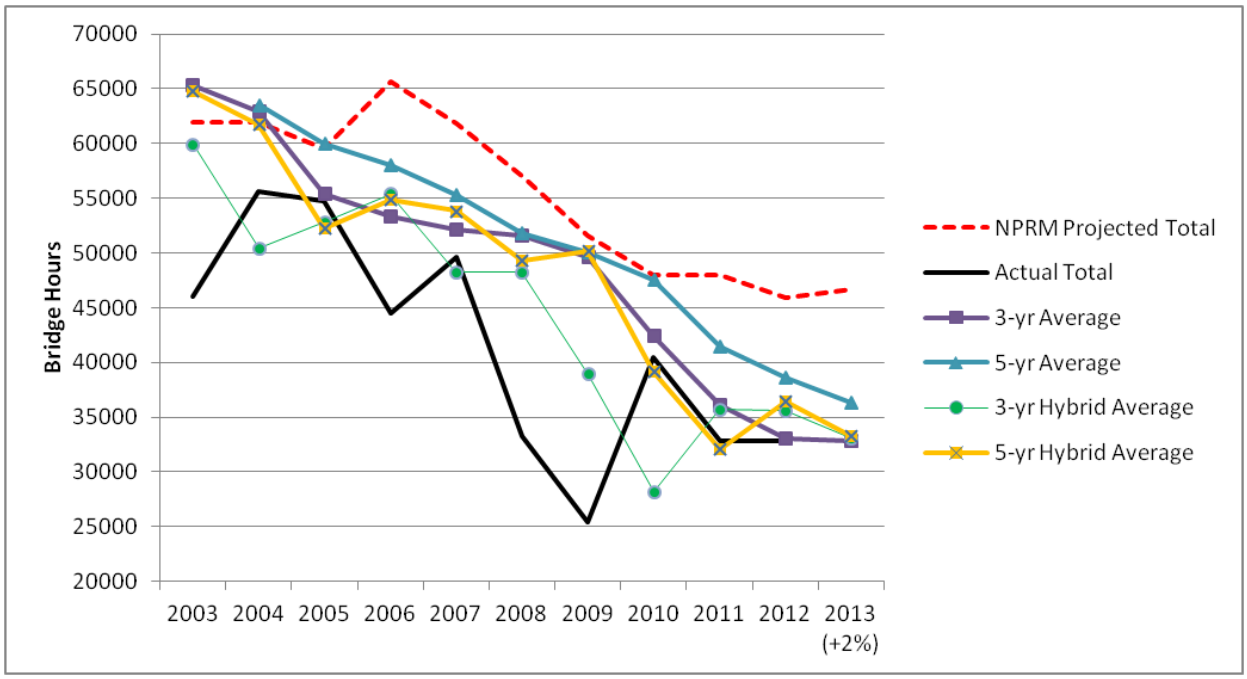

Figure B-4: Effects of Applying Historical Averages

A comparison to the 2013 Final Rule projected demand and each alternative is provided in **Table B-10: Comparing Historical Averages Alternatives.** In order to calculate the hybrid historical average for the current year, data through September 2012 was compared to the same time frame in 2011. The total actual demand for 2012 was then adjusted based on that YTD comparison. For the projected demand in 2013, an estimated 2% rise in total 2012 demand was calculated. A comparison to the 2013 Final Rule projected demand is provided from two perspectives:

- **Trips –** Staying consistent with the current definition of "Bridge Hour" not including delays, detentions, and cancellations and dividing the 2013 Final Rule projected demand in hours by the average Trip Time from **Table B-3: Example Average Pilot Assignment Cycle for Each Area.**
- **Assignments –** Incorporating activities necessary and reasonable to provide pilotage services which included average delays, detentions, and cancellations and dividing the 2013 Final Rule projected demand in hours by the average Time on Assignment from **Table B-3: Example Average Pilot Assignment Cycle for Each Area.**

Table B-10: Comparing Historical Averages Alternatives

		2013 FR Projected Demand (Hours)	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	433	550	613	581	**629**
	Area 2	5,509	530	337	436	466	438	**451**
	Welland Canal Exclusive to Canadian Pilots							
D2	**Area 4**	6,814	614	403	344	362	342	**330**
	Area 5	5,102	836	499	561	602	562	**562**
D3	**Area 6**	11,411	507	432	435	462	431	**427**
	Area 7	3,223	454	281	270	256	252	**223**
	Area 8	9,540	442	328	216	222	216	**206**

An assessment of these alternatives is provided in **TableB-11: Assessment Supporting Applying an Average to Project Demand.** The recommended adjustment is to use a three-year hybrid historical average (Alternative 4).

Table B-11: Assessment Supporting 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	A projection that is too high will 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	
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	
Clarity	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 is 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.

Recommended Adjustments:

- Baseline the calculation on actual recently experienced demand to increase the objectivity of the process; discontinue projecting demand based on previous estimated demand.
- Use a three-year hybrid historical average to provide a balance of historical demand (two years) with projected demand for the upcoming year. The addition of a single projected growth value in the average allows for compensation of exceptional circumstances.
- Benchmark projections for the forecasted ratemaking year against available economic forecasts. Chase Bank provides a report on the economic conditions for the Midwest

Region.[18] Sources of nationwide economic forecast indicators are also available.[19] Although these may vary marginally from the conditions specific to the Great Lakes, the small variances are mitigated by the fact that the hybrid historical average is influenced predominantly by the inclusion of the two years' previous historical demand.

- Stipulate demand 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.

The impact of using a hybrid historical average on the number of pilots estimated for the 2013 Final Rule is shown in **Table B-12: Example Impact of Hybrid Historical Average on Number of Pilots.** The projected number of assignments for each area from **Table B-10: Comparing Historical Averages Alternatives** is divided by the expected number of assignments per pilot from **Table B-8: Example 50% Expected Pilot Utilization** to estimate the number of pilots.

Table B-12: 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 Expected Assignments 50% Utilization	Example Pilots Needed
D1	Area 1	5.2	629	100	6.3
	Area 2	3.1	451	85	5.3
	Area 3	***Welland Canal Exclusive to Canadian Pilots***			
D2	Area 4	3.8	330	84	3.9
	Area 5	5.1	562	108	5.2
D3	Area 6	6.3	427	63	6.8
	Area 7	3.2	223	102	2.2
	Area 8	5.3	206	59	3.5

Performing the comparison without adjusting the seasonal work standard (**Appendix B.2**) or definition of bridge hours (**Appendix B.1**) gives the appearance that significantly more pilots are necessary in some areas. Any adjustments to the seasonal work standard, definition of bridge hour, and projecting demand need to be reviewed collectively.

B.3.2 Estimating the Number of Pilots

The number of pilots establishes the capacity to meet projected demand and surge traffic within a reasonable seasonal work standard. 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).

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

[19] 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.

The number of pilots establishes the capacity to meet projected demand and surge traffic within a reasonable seasonal work standard. Sufficient number of pilots on the Tour de Role limit the need to recall pilots from scheduled days off during surge traffic periods. Recalling pilots from scheduled time off impacts their quality of life. A balance must be struck between how often pilots are recalled from scheduled days off during surge traffic periods and having too many pilots on the Tour de Role during low-traffic periods. The 50% pilot utilization factor identified in **Appendix B.2** is based on the average Pilot Assignment Cycle, taking into account all activities reasonable and necessary to provide pilotage services, ship scheduling efficiency, and addressing cumulative short-term fatigue for pilots. This section looks at adjusting the pilot utilization factor within the seasonal work standard to establish staffing levels to respond to traffic surges.

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 industry stakeholders, who did not consider pilotage delay (delay waiting for a pilot to arrive) an issue.

Whisker diagrams for jobs per day experienced in 2011 are provided in **Appendix C** 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.

Establishing a staffing level to reasonably balance the number of pilots on the Tour de Role can be accomplished statistically. It was verified from the 2011 Klein system data that the distribution of the number of jobs per day performed within each District follows a Poisson distribution.[20] Statistically approximating the distribution allows for calculating the cumulative distribution function to determine how many pilots are necessary to respond to surge traffic an acceptable percentage of the time without having to recall pilots. This acceptable percentage establishes a threshold. 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 B-5: 2011 Distribution of Jobs/Day.** A Poisson distribution is superimposed on the figure with dotted lines. The mean used in the Poisson distribution formula was adjusted so that the calculated distribution (dotted line) most closely aligned with the actual distribution (solid line) in the area of interest.[21]

A threshold is designed to minimize the number of occurrences when surge traffic exceeds the number of pilots on the Tour de Role and causes a recall from scheduled days off. This threshold can be varied based on the frequency with which pilots are recalled from scheduled days off or delays experienced by shipping. The threshold is increased if an increase in either recall or delays is experienced. Improving the Klein system data as recommended in **Appendix B.11.5** facilitates monitoring of this information.

[20] It is a widely- and long-accepted practice in queuing theory to model the inter-arrival times in a random system as a Poisson distribution. The 2011 data confirmed this distribution. The number of jobs for each day in the season was determined from the Klein system data and a distribution generated from that data.

[21] 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.

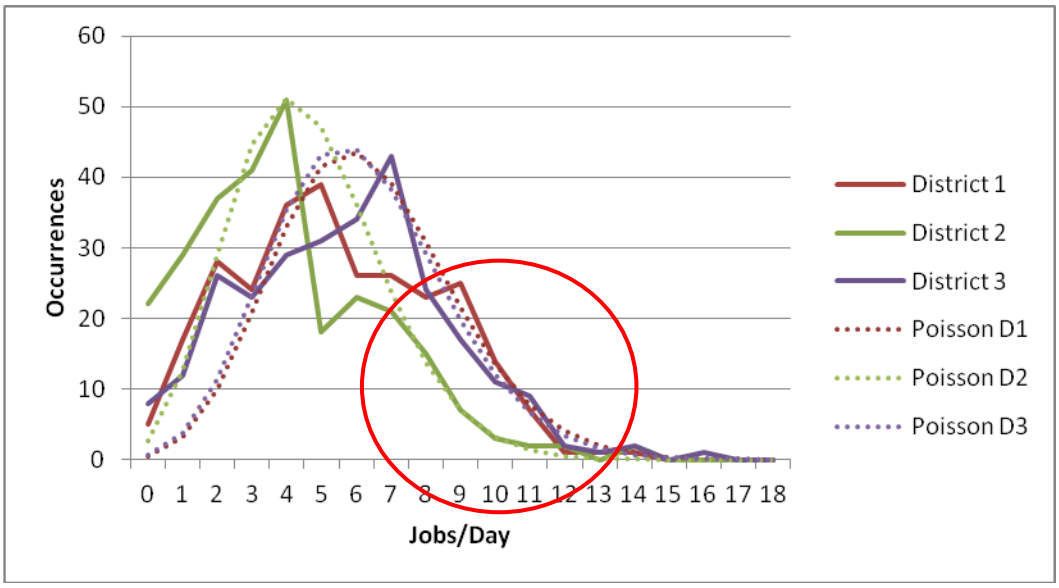

Figure B-5: 2011 Distribution of Jobs/Day

Assessment of Alternatives:

Three alternatives were evaluated to tailor the pilot utilization factor discussed in **Appendix B.2** to be able to respond to 90% of the occurrences of surge traffic without recalling a pilot. Comparison of these alternatives is provided in **Table B-13: Example Staffing Level Alternatives.** From the estimated cumulative distribution function, the number of pilots needed to be able to respond to 90% of the surge traffic demand without having to recall a pilot was determined. Determining how many pilots will be on the Tour de Role is done by first multiplying the number of pilots by the recommended 10 days to determine the total scheduled time off (STO) each month. The total number of scheduled days off in a month is 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 surge traffic demand without having to recall a pilot. A 50% pilot utilization factor (Alternative 1) does not provide a sufficient number of pilots and increases the probability of recall from scheduled time off. A 40% pilot utilization factor (Alternative 2) exceeds the number of pilots needed in some Districts, increasing costs for excess capacity. A pilot utilization factor that varies for each District (Alternative 3) provides a sufficient number of pilots to respond to 90% of the occurrences of concurrent traffic in excess of the number of pilots on the Tour de Role.

Table B-13: Example Staffing Level Alternatives

	District 1	District 2	District 3
Number of Jobs/Day 90% of Surge Traffic	**9**	**7**	**9**
Alternative 1: 50% Pilot Utilization Factor			
Pilots Authorized	11.6	9.1	12.5
Total Scheduled Time Off (STO) (days/mo)	116	91	125
Average Pilots on STO (pilots/day)	3.9	3.0	4.2
Pilots Available on Tour de Role	7.7	6.1	8.3
Alternative 2: 40% Pilot Utilization Factor			
Pilots Authorized	14.5	11.5	15.6
Total STO (days/mo)	145	115	156
Average Pilots on STO (pilots/day)	4.8	3.8	5.2
Pilots Available on Tour de Role	9.7	7.7	10.4
Alternative 3: Tailored Pilot Utilization Factor			
Pilot Utilization Factor	43%	43%	46%
Pilots Authorized	13.5	10.6	13.5
Total STO (days/mo)	135	106	135
Average Pilots on STO (pilots/day)	4.5	3.5	4.5
Pilots Available on Tour de Role	9.0	7.1	9.0

This example calculation was completed with the available jobs-per-day data in the Klein system. It is possible for a pilot to perform more than one job in a day, so the probability that there are a sufficient number of pilots on the Tour de Role will increases. The Pilots Authorized would be rounding up to the next whole pilot providing additional capacity to respond to surge traffic demand and further reducing the probability that a pilot will need to be recalled from scheduled time off. In the remaining circumstances where a pilot is not available on the Tour de Role, an additional charge for recalling a pilot should be assessed and documented within the association working rules (discussed in **Appendix B.11.1**). That rule needs to balance competing needs of pilot time off and shipping demand.

An assessment of these alternatives is provided in **Table B-14: Assessment Supporting Estimating the Number of Pilots.** The recommended adjustment is to apply a tailored pilot utilization factor when calculating staffing levels (Alternative 3).

Table B-14: Assessment Supporting 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				
Ratemaking Process	4	4	0	**Risk to the Ratemaking Process**
Stability/Repeatability	1	1	0	
Transparency	1	1	0	
Clarity	1	1	-3	
Accounts for Interdependencies	1	1	3	
Promotes Investments				
Overall Assessment	8	8	10	
Comment:				

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 B-15: 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 within the District. 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. Monitoring the frequency pilots are recalled from scheduled days off and delays experienced by shipping provides an indicator of whether the threshold should be changed – increased if there are more recall/delays or decreased if fewer.

Table B-15: 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. Three 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 B-16: District 2 Maximum Assignments 16 April 2008.** This accounts for all 10 pilots in District 2 during that day; it is likely someone was recalled from scheduled time off to meet this demand.

Table B-16: 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)

Recommended Adjustments:

- Provide an objective means for estimating the number of pilots necessary to meet surge traffic by statistically estimating the distribution of surge traffic based on the most recent complete set of data and then scaled by the ratio of experienced demand of the dataset and projected demand for the upcoming ratemaking year.
- Establish an acceptable threshold on how often the traffic demand within a day statistically exceeds the number of pilots on the Tour de Role. Carry out discussions between pilots and industry on an acceptable threshold, balancing the cost of delays and the expected pilot recall.
- Specify in the association working rules the number of scheduled days off and under what circumstances a pilot can be recalled from scheduled time off. Document rules for assessing an additional charge to industry for recalling a pilot from scheduled time off and additional compensation to the pilot for being recalled.

B.4 Billing Scheme and Baselining the Tariff Card

The billing scheme is the method by which pilot fees are charged for services 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 B-17: Billing Schemes Overview** provides a listing and an assessment of the various billing schemes that are used in the current ratemaking process. There are two components associated with the billing scheme:

- How fees are structured. Currently, a mix of time and point-to-point billing methods makes it difficult to project revenue generated given an assumed demand. A consistent unit of measure (assignments) should be used across all calculations.

- Amount charged. Ensuring the fees are sufficient to recover the required revenue (assuming projected demand is realized).

B.4.1 Structuring the Billing Scheme

Currently, a mix of time and point-to-point billing methods makes it difficult to project revenue generated. A consistent unit of measure (assignments) should be used across all calculations. It is recommended the tariff card be structured consistently with point-to-point charges for service and a collection of miscellaneous charges.

The current ratemaking methodology only has a loose coupling between the revenue generated and the revenue produced. A ratio between the revenue required and the revenue projected to be generated scales the rates from the previous year through the application of the rate multiplier. The projected revenue is based on a tariff card with rates that are currently not associated with the distribution in volume of traffic, ship weighting factors, or pilot capacity consumed. The revenue projected to be generated is based on estimates from the previous year.

The existing process of applying a rate multiplier to the existing tariffs is another example of estimates being applied to previous estimates, carrying forward any errors in the current tariff structure or rate. The traffic distribution of volume and ship weighting factors varies over time and impacts the amount of revenue generated. The tariff card should be re-baselined, at a minimum, every three years so that the information used in estimating the projected revenue more accurately reflects the distribution of traffic. The process of re-baselining the tariff card will also recalculate the average transit times and influence the length of the pilot assignment cycle used to determine pilot capacity.

Incorporating the revenue required in this process addresses the revenue gap by baselining tariffs so that the tariffs generate the revenue required provided demand is as expected. An analysis was performed using 2011 Klein system data to determine demand and average hourly revenue generated. Those parameters were replaced within the 2013 Final Rule to determine revised rate multipliers. When the revised rate multipliers were applied to the 2012 rates and those rates were assessed against the 2011 traffic distribution and density, sufficient revenue was generated.

Table B-17: 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 within 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.			

Issues 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, consuming pilot capacity at a lower rate.
- 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 pilot 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 effective use of pilot capacity is critical to an efficient pilot system. Applying time standards to transits of vessels will provide a consistent means for establishing tariffs and promote efficient use of pilot capacity. The standards provide a baseline to identify those situations in which a transit has been prolonged and to assess additional fees if necessary.

In this example, standard transit times were derived from the Klein system data, taking the average transit time for each leg. To compensate for variances in traffic and avoid the risk of rushing the passage of vessels to meet the standard, the average is increased by one standard deviation. There are no additional charges if the ship completes a transit within this standard. The transit times determined in this section are established to identify when a ship should be considered a slow-moving vessel and an additional charge be imposed for consuming additional pilot capacity. Only when the vessel exceeds the standard transit time for "convenience of the ship"[22] will the additional charge be assessed.

To illustrate the self-correcting nature of the recommended approach, 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 in the number of pilots to meet demand. Any advantage to shipping for increasing the length of a transit is balanced against additional costs for additional pilot capacity.

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

[22] 46 CFR 401

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. A separate docking 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 average transit time was increased by one standard deviation and 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; 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 B-18: 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.

Table B-18: 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 & Port Weller	13	2
Cape Vincent & Western Ontario Port	16	3
Port Weller & Western Ontario Port	5	1
Western Ontario Port Change	7	1
Movage	3	1
Area 4		
Port Colborne & Ashtabula	10	2
Port Colborne & Cleveland	15	3
Port Colborne & Erie	7	1
Port Colborne& Southeast Shoal	15	3
Southeast Shoal & Ashtabula	7	1
Southeast Shoal & Cleveland	7	1
Southeast Shoal & Erie	10	2
Movage	2	0
Area 5		
Port Huron Change Point & Detroit River	11	2
Port Huron Change Point & Detroit Pilot Boat	9	2
Detroit, Windsor, or Detroit River & Southeast Shoal	6	1

Transit Definition	Alt 1: Standard (hrs)	Alt 2: 6-Hr Blocks
Detroit Pilot Boat & Southeast Shoal	8	1
Toledo or any Point on Lake Erie W. of Southeast Shoal & Southeast Shoal	8	1
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
Movage	3	1
Area 6		
B12 & DeTour, Cheboygan, or Mackinac	17	3
B12 & Green Bay, Menominee, or Sturgeon Bay	47	8
B12 & Goderich, ON	14	2
B12 & Little Current, ON	27	5
B12 & Milwaukee	42	7
B12 & Southern Lake Michigan	61	10
DeTour, Cheboygan, or Mackinac & Green Bay, Menominee, or Sturgeon Bay	36	6
DeTour, Cheboygan, or Mackinac & Little Current, ON	45	8
DeTour, Cheboygan, or Mackinac & Milwaukee	25	4
DeTour, Cheboygan, or Mackinac & Southern Lake Michigan	29	5
DeTour, Cheboygan, or Mackinac & Tobermory, ON	12	2
DeTour, Cheboygan, or Mackinac & Traverse City	9	2
Green Bay, Menominee, or Sturgeon Bay & Southern Lake Michigan	25	4
Goderich, ON & DeTour, Cheboygan, or Mackinac	22	4
Goderich, ON & Green Bay, Menominee, or Sturgeon Bay	51	9
Goderich, ON & Southern Lake Michigan	42	7
Milwaukee & Green Bay, Menominee, or Sturgeon Bay	28	5
Milwaukee & Southern Lake Michigan	15	3
Within Southern Lake Michigan	6	1
Traverse City & Southern Lake Michigan	24	4
Tobermory, ON & Little Current, ON	5	1
Movage	12	2
Area 7		
Gros Cap & DeTour	10	2
Sault Ste. Marie, MI & Gros Cap	4	1
Sault Ste. Marie, MI & DeTour and any point in between	13	2
Movage	4	1
Area 8		
Gros Cap & Duluth or Superior	31	5
Gros Cap & Thunder Bay	18	3
Duluth or Superior & Thunder Bay	22	4
Movage	4	1

To minimize the transit point listing, some transits have been combined with an "and all points in between" approach, as appropriate. For example, this was done in Area 7 to account for a single stop in Hay Lake Anchorage. Ports associated with each grouping are listed in **Table B-19: Combined Transit Definitions.**

Table B-19: Combined Transit Definitions

Transit Definition	Included Ports
Snell & Cape Vincent	• Prescott • 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 generate further revenue on a subsequent assignment. Exceeding the time standard can occur in two situations:

- **Exceeding the standard caused by ice, weather, or traffic.** In these circumstances, safe navigation of the vessel is paramount, and additional charges are made at the average hourly rate.
- **Exceeding the standard for the convenience of the ship.** In this circumstance, there is an advantage to the ship, but more pilot capacity is being consumed. An additional charge should be assessed; for example, the average hourly charge for the transit plus 50% the hourly charge for each hour the trip is extended beyond the standard transit time.

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 six-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 recommended adjustment is to take a more homogeneous perspective across pilot services 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. **Appendix B.4.2** 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.

Assessment of Alternatives:

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-20: Assessment Supporting 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			
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			
Clarity	-1	-1	
Accounts for Interdependencies			
Promotes Investments			
Overall Assessment	5	1	
Comment:			

Recommended Adjustments:

- 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 transit time reflects a tariff structure based on the amount of pilot capacity consumed.

- Discontinue differentiating between undesignated and designated waters when structuring the tariffs. 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 in undesignated or designated waters.
- If a ship exceeds the standard time for convenience of the ship, additional hours will be assessed at the average hourly rate for that transit plus 50%. There are no additional charges for an interruption or detention caused by ice, weather, traffic, etc.; only the average hourly rate for that Area is applied for each hour beyond the standard.
- Remove the maximum charge for delay, detention, or cancellation, and charge the hourly rate for that Area regardless of the length of delay. Currently the maximum charge for delay, detention, or cancellation is capped at a maximum 24-hour amount equivalent to only 15.6 hours. In essence, 8.4 hours of pilot capacity is being consumed with no revenue being generated.

Adjusting the billing structure will require retraining 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.

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 Final Rule in **Table B-21: Hourly Transit Standard Tariff Example.** (The Standard Hourly Transit Times were defined in **Table B-18: Example Standard Hourly Transit and Six-Hour Blocks.**) 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 for each 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. 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.[23] 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. This notional hourly rate was multiplied by the standard transit time to determine a tariff for each transit. If traffic distribution is unchanged, the required revenue is generated based on the summation of all transits weighted by the pilotage unit factor.

A comparison to the cost of each transit based on 2013 Final Rule tariffs is also provided in **Table B-21: Hourly Transit Standard Tariff Example.** The method for determining these rates will be discussed in the next section. To determine 2013 Final Rule estimates, a single dockage fee was assumed for some transits (marked with an asterisk). With some transits, significant variances from the 2013 Final Rule tariff occur because of:

[23] Only transits are included in calculating a notional hourly rate for pilot services. Movages are not included in determining the total aggregate hours because of their variability and should not be included in plans to recover revenue.

- The revenue gap between revenue required and the revenue generated. In 2011, this was a 27.6% revenue gap. The leading contributor to this gap was a mismatch between projected and actual demand. A higher projected demand lowered the rates.
- The process of determining example tariffs based on the actual distribution of the traffic, ship weighting factors, and the length of the transit (pilot capacity consumed).

This table only takes into considerations changes to established rates associated with transits. It does not consider other adjustments within this report. A comprehensive collection of adjustments and example rates is provided in **Section 3.6** in the main body of the report.

Table B-21: Hourly Transit Standard Tariff Example

Transit Definition	2013 FR Rates	Proposed 2013 Rate	Percentage Increase/ Decrease
Area 1 (Designated)			
Snell & Cape Vincent	$3,984	$4,563	14.5%
Area 2 (Undesignated)			
Cape Vincent & Port Weller	$2,553	$2,894	13.4%
Cape Vincent & Western Ontario Port*	$3,365	$3,562	5.9%
Port Weller & Western Ontario Port*	$1,663	$1,113	-33.1%
Western Ontario Port Change*	$2,514	$1,558	-38.0%
** Assumes one dockage when estimating 2013 FR rate*			
Area 4 (Undesignated)			
Port Colborne & Ashtabula*	$2,293	$2,474	7.9%
Port Colborne & Cleveland*	$3,121	$3,710	18.9%
Port Colborne & Erie*	$2,293	$1,731	-24.5%
Port Colborne & Southeast Shoal	$2,484	$3,710	49.4%
Southeast Shoal & Ashtabula*	$2,293	$1,731	-24.5%
Southeast Shoal & Cleveland*	$2,293	$1,731	-24.5%
Southeast Shoal & Erie*	$2,293	$2,474	7.9%
** Assumes one dockage when estimating 2013 FR rate*			
Area 5 (Designated)			
Port Huron Change Point & Detroit River	$3,060	$4,795	56.7%
Port Huron Change Point & Detroit Pilot Boat	$2,381	$3,924	64.8%
Detroit, Windsor, or Detroit River & Southeast Shoal	$2,339	$2,616	11.8%
Detroit Pilot Boat & Southeast Shoal	$1,693	$3,488	106.0%
Toledo or any Point on Lake Erie W. of Southeast Shoal & Southeast Shoal	$2,339	$3,488	49.1%
Toledo or any Point on Lake Erie W. of Southeast Shoal & Detroit River	$3,037	$3,924	29.2%
Toledo or any Point on Lake Erie W. of Southeast Shoal & Detroit Pilot Boat	$2,339	$3,488	49.1%
Area 6 (Undesignated)			
B12 & DeTour, Cheboygan, or Mackinac	$2,073	$2,283	10.1%
B12 & Green Bay, Menominee, or Sturgeon Bay*	$6,184	$6,312	2.1%
B12 & Goderich, ON*	$2,729	$1,880	-31.1%
B12 & Little Current, ON*	$4,111	$3,626	-11.8%
B12 & Milwaukee*	$5,493	$5,640	2.7%
B12 & Southern Lake Michigan*	$8,257	$8,192	-0.8%
DeTour, Cheboygan, or Mackinac & Green Bay, Menominee, or Sturgeon Bay*	$4,802	$4,835	0.7%

Transit Definition	2013 FR Rates	Proposed 2013 Rate	Percentage Increase/ Decrease
DeTour, Cheboygan, or Mackinac & Little Current, ON*	$4,111	$6,043	-2.3%
DeTour, Cheboygan, or Mackinac & Milwaukee*	$4,111	$3,357	-18.3%
DeTour, Cheboygan, or Mackinac & Southern Lake Michigan*	$4,111	$3,895	-5.3%
DeTour, Cheboygan, or Mackinac & Tobermory, ON*	$2,038	$1,612	-20.9%
DeTour, Cheboygan, or Mackinac & Traverse City*	$2,038	$1,209	-40.7%
Green Bay, Menominee, or Sturgeon Bay & Southern Lake Michigan*	$4,111	$3,357	-18.3%
Goderich, ON & DeTour, Cheboygan, or Mackinac*	$2,729	$2,955	-13.6%
Goderich, ON & Green Bay, Menominee, or Sturgeon Bay*	$4,802	$6,849	-0.4%
Goderich, ON & Southern Lake Michigan*	$5,493	$5,640	2.7%
Milwaukee & Green Bay, Menominee, or Sturgeon Bay*	$4,111	$3,760	-8.5%
Milwaukee & Southern Lake Michigan*	$2,729	$2,014	-26.2%
Within Southern Lake Michigan*	$1,347	$806	-40.2%
Traverse City & Southern Lake Michigan*	$3,420	$3,223	-5.8%
Tobermory, ON & Little Current, ON*	$1,347	$671	-50.1%
** Assumes one dockage when estimating 2013 FR rate*			
Area 7 (Undesignated)			
Gros Cap, ON & DeTour	$2,583	$5,305	105.4%
Sault Ste. Marie, MI & Gros Cap, ON	$973	$2,122	118.1%
Sault Ste. Marie, MI & DeTour and any point in between	$2,165	$6,896	218.5%
Area 8 (Undesignated)			
Gros Cap, ON & Duluth or Superior*	$3,487	$7,945	127.8%
Gros Cap, ON & Thunder Bay, ON*	$2,315	$4,613	99.3%
Duluth or Superior & Thunder Bay, ON*	$2,901	$5,638	94.4%
Additional Charges			
Delay, Detention, Cancellation in excess of one hour, or exceeding the Transit Standard for convenience of the ship (per hour – no maximum)			
District 1	$126	$269	113%
District 2	$126	$354	181%
District 3	$126	$214	70%
Other Charges			
Cancellation (flat rate)	$705	$0	-100%
Movage Area 1	$1,361	$652	-52.1%
Movage Area 2	$1,624	$668	-58.9%
Movage Area 4	$1,274	$495	-61.2%
Movage Area 5	N/A	$1,308	100%
Movage Area 6	$1,312	$1,612	22.8%
Movage Area 7	$973	$2,122	118.1%
Movage Area 8	$1,114	$1,025	-8.0%

B.4.2 Baselining the Tariff Card

The history of the existing distribution of tariffs published is uncertain and beyond the scope of this research. The current process of applying a rate multiplier to the existing tariffs is another example of estimates being applied to previous estimates, carrying forward any errors in that estimation. 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.

An example method of baselining tariffs is carried out in a similar manner in which the example billing schemes were produced in the previous section on 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. Determine the number of occurrences of each type of charge for each Area for each vessel type (weight factor) from the most recently available complete data set.
2. Determine the average time to provide each transit from the most recently available complete data set. Standard transit times are determined by adding one standard deviation to the average.
3. Determine the revenue required for the upcoming ratemaking year.
4. Using only transits 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) by the standard transit time (found in Step 2).
5. Divide the total revenue required (Step 3) by the total number of weighted hours (Step 4) to determine an average allowance for an hour of pilot capacity in each Area.
6. Multiply the standard transit time (Step 2) by the average allowance for a weighted hour (Step 5) to estimate the tariff for that transit.
7. Scale the tariff by the ratio of demand experienced from the most recent dataset used in Step 1 to the projected demand for that Area (i.e., if demand is projected to be higher, the tariff should be lowered because there is more opportunity to collect revenue in the projected year). This compensates for the difference in demand for the upcoming year and the actual demand of the data set used; the concept of a "rate multiplier" is now applied in a more straightforward manner.

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 required.

Recommended Adjustment:

On a regular basis, the listing of tariffs should be re-baselined to ensure it reflects 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).[24] Additionally, the process of re-baselining the tariff card supports a

[24] 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.

recalculation of the standard trip time and identifies any necessary adjustments to the Pilot Assignment Cycle discussed in **Appendix B.2.**

B.5 Target Rate of Return on Investments

The goal of the target rate of return is to "determine a market equivalent ROI 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. The current methodology in *Step 6: Adjustment Determination* infers that the calculation is managing a reasonable operating profit for the association. This ambiguity should be removed.

The ROI is intended to promote investment in infrastructure, new technologies, and training. The limited investment base ROI is applied to does not provide sufficient motivation. In a revenue gap situation, covering the ROI comes at the expense of lowering pilot compensation further reducing the motivation for investment.

A revenue gap experienced in the past has made it difficult for associations to acquire sufficient capital for larger infrastructure investments. By addressing the revenue gap, the risk on investments is completely removed and motivation for investment is increased. Risk to pilot compensation and the revenue gap are discussed in the Business Risk Reserve approach described in **Appendix B.11.3**.

Moody's indicator provides a slightly higher rate of return when compared to other public investments with low-risk and medium-term liquidity. Another index could be used, such as U.S. Treasury securities, federal agency securities, or corporate notes rated "A" or higher and having a maturity level of five years or less; however, 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 and applies to medium-term liquidity investments. A comparison to other benchmarks for public investments is provided in **Table B-22: Comparison of Public Investment Indices.**

Table B-22: 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%

Considerations for selecting 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

Recommended Adjustments:

- Continue using the Moody's Seasoned Aaa Corporate Bond indicator. It is readily available and consistently updated.
- If the recommendation to establish a Business Risk Reserve is not implemented:
  - Simplify the calculation for ROI to multiplying the investment base by the current Moody's Seasoned Aaa Corporate Bond indicator, and include that amount when projecting revenue required along with expenses and pilot compensation (from the 2013 FR, see Table 25 – Revenue Needed to Recover Target ROI, by Area). 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.

B.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). In Step 2.C of the current ratemaking process, the estimated pilot compensation is multiplied by the number of pilots in an Area to arrive at an Area-specific total pilot compensation value.

Issues associated with pilot compensation include:

- The uncertainty of pilot pay has a potential impact on being able to recruit and retain well-qualified individuals.
- Pilots are not able to attain the target compensation.
- Pilots desire higher target compensation.
- The calculation to estimate pilot compensation with multiple union contracts is lengthy and reduces 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 the AMO unions. This makes it difficult to obtain accurate union compensation rates in a timely manner.
- The applicability/validity 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 has been called into question.
- Whether there should be a differentiator between undesignated and designated waters. The pilots are certified for both undesignated and designated waters, and many operate in both interchangeably.
- Using current calculation methodology, 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 target compensation should be:

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

An attempt to identify comparisons between the Great Lakes pilotage environment and 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 two 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 recommended adjustment to discontinue differentiating between undesignated and designated waters and a single recommended adjustment to apply an escalation factor will be considered with four alternative compensation benchmarks. This will avoid presenting all the possible combinations of these alternatives.

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 in pilot expectations 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. On occasion, designated water pilots in Area 1 perform assignments in undesignated waters in Area 2.

The recommended adjustment is to simplify the calculations and establish a single annualized estimated pilot compensation rate. All the base pilot compensation alternatives listed below will provide a single compensation level and remove 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 Employment Cost Index (ECI). Both of these indexes are:

- Major economic indicators published by the U.S. Bureau of Labor Statistics (BLS);
- Retrospective series, measuring changes that have occurred, and available on a quarterly basis; and
- Reliable and accessible values to estimate year-to-year adjustments in pilot compensation.

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 ECI 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.

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.

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:

- The ECI for private industry, company size 50–99 employees, will be used to estimate percentage of benefits in total compensation.
- The ECI for occupational group "management, professionals, and related occupations" will be used to escalate wages and compensation for years the federal pilot compensation rate is not available.

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 values
- Canadian Great Lakes Pilotage Authority average compensation
- Federal pilot wages and U.S. Bureau of Labor Statistics (BLS) averages for benefits
- Pilots and industry discuss a reasonable level of compensation and the impact on the rate.

Alternative 1: AMO Union Contract Values

Significant issues about the availability of information and use of the AMO union contracts to estimate pilot compensation were highlighted with the 2013 ratemaking Notice of Proposed Rulemaking (NPRM) and 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 union is not required to share union information with the Coast Guard. AMO union information may be widely available, but the ability to release that information in a public forum is restricted. The transparency of the ratemaking process is diminished if permission to release this information is not obtained from AMO.

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 as U.S. pilots. 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 rest days not taken;
- End-of-year productivity bonus; and
- A scaling factor for overtime (when pilots exceed a specified number of assignments during the season).

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, available to the public. In the 2011 Annual Report they report 56.5 pilots in 2011 and total Pilot Salaries and Benefits[25] as C$13,196,544. This translates into C$233,567 per pilot. Applying a 1.6% ECI for 2011 and 1.2% ECI for 2012 provides an escalated compensation of C$240,152 (US$233,157 with a conversion factor of 1.03 Canadian to 1.00 U.S.). This figure is total compensation.[26]

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, adjusted to $320,021 for ECI (US$310,700 with a conversion factor of 1.03 Canadian to 1.00 U.S.). 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 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 2011[27] at an annual wage rate of $176,445. This rate was implemented in January 2011 and 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.[28] For the period ending in September 2012, the

[25] Salary, overtime, productivity pay, pension plan matching pay, major medical and dental

[26] 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."

[27] www.public.navy.mil/donhr/compensation/paysystems/Pages/ShipPilots.aspx; an updated rate is anticipated to be provided in spring 2013.

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

benefit rate for small private companies with 50–99 employees was 28.7% of total compensation (or, equivalently, 40.2% 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 are escalated with the ECI for occupational group "management, professionals, and related occupations."

Alternative 4: Pilots and Industry Discuss a Reasonable Level of Compensation

Similar to how compensation levels are discussed within the Canadian GLPA, the pilots and industry discuss a reasonable level of compensation (wages and benefits), with annual escalation for the duration of the agreement to propose to GLPAC. GLPAC then make a recommendation to the Coast Guard, substantiated by the previous discussion between pilots and industry. This approach opens communication among stakeholders and increases the transparency of the process.

Comparison of Alternatives:

A comparison of the alternatives is presented in **Table B-23: Comparison of Alternative Compensation Benchmarks.** 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. 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. Benchmark wages for the federal pilot are publicly available. Estimation of benefits is based on BLS data, estimating benefits at 28.7% of total compensation (40.2% of wages) for the private sector small companies.

Table B-23: Comparison of Alternative Compensation Benchmarks

	2013 NPRM Weighted Average (for comparison only)	Alt 1 2013 AMO Weighted Average	Canadian LPA (for comparison only)	Alt 2 2013 Canadian GLPA	Alt 3 2013 Federal Pilot	Alt 4 Discussed Between Pilots and Industry
Wages					$181,419[29]	Specific values to be Discussed & Proposed
Benefits					$73,026[30]	
Compensation	$246,287	$183,625	$310,700[31]	$233,157[32]	$254,445	

[29] Based on 2011 published wage adjusted for 1.6% ECI for 2011 and 1.2% ECI for 2012

[30] Based on benefits being 28.7% of total compensation for private industry, company size 50–99

[31] 2011 LPA average adjusted for 1.6% ECI for 2011 and 1.2% ECI for 2012; 1.03 Canadian to 1.00 U.S. dollar conversion

[32] 2011 GLPA average adjusted for 1.6% ECI for 2011 and 1.2% ECI for 2012; 1.03 Canadian to 1.00 U.S. dollar conversion

Assessment of Alternatives:

- **Alternative 1:** AMO Union Contract Values (current practice)
- **Alternative 2:** Canadian Great Lakes Pilotage Authority Compensation
- **Alternative 3:** Federal Pilot Compensation
- **Alternative 4:** Pilots and Industry Discuss a Reasonable Level of Compensation

An assessment of alternative benchmarks for pilot compensation is summarized in **Table B-24: Assessment Supporting Pilot Compensation.**

Table B-24: Assessment Supporting 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 marginally impacted by a change in target compensation. Stability in receiving that compensation is a greater factor and is addressed in other recommended adjustments.
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					
Cost	0	1	5	11	**Risk to Cost**
Reasonable Rates	0	1	1	5	Pilot compensation is approx. 70% of expenses, causing a direct correlation between compensation and rates.
Stable Rates	0	-1	3	1	
Fair Pilot Compensation	0	1	1	5	
Adequate Cost Recovery					
Ratemaking Process	0	5	8	9	**Risk to the Ratemaking Process**
Stability/Repeatability	0	-3	3	1	Discussions among stakeholders provide full visibility and clarity. Reliance on year-to-year variances based on other external factors (union contracts) and lack of visibility into proprietary information cause concern/anxiety.
Transparency	0	5	5	5	
Clarity	0	3	1	3	
Accounts for Interdependencies					
Promotes Investments					
Overall Assessment	0	7	14	21	
Comment:					

Recommended Adjustments:

- Pilots and industry discuss a reasonable level of compensation and the impact on the rate, using:
  - A single compensation rate for both undesignated and designated waters. This simplifies the ratemaking process, recognizes the pilots for equivalent certification, and equates all pilot capacity. A baseline of the AMO union contracts and comparison to federal pilot compensation and GLPA compensation levels support the discussion.
  - The ECI for private industry, company size 50–99 employees, to estimate percentage of benefits in total compensation.
  - The ECI for occupational group "management, professionals, and related occupations" to escalate wages and compensation for years the federal pilot compensation rate is not available.
- Include standardization and visibility of allowance as part of the updates to each association working rules.

An example comparison of the impact on compensation within each District and the values for the federal pilot wages are provided in **Table B-25: Example Impact on 2013 Pilot Compensation.** A weighted average for pilot compensation from the Final Rule is used to compare to the single value for estimated Federal Pilot Compensation.

Table B-25: 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	$254,445
District 2	4	6	$158,694	$217,906	$194,221	$254,445
District 3	13	4	$158,694	$217,906	$172,626	$254,445

B.7 System Implications

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 risks within the system that do not result in an incident or delay. Although these practices have not resulted in an incident, they have created risks that can either be avoided or reduced.

Topics already discussed that address hidden risk are:

- The establishment of a seasonal work standard in **Appendix B.2** that accounts for all activities associated with providing pilot services, including sufficient rest.
- The use of a hybrid historical average based on historical and one year of benchmarked projections to project demand and surge traffic distributions in **Appendix B.3** to determine adequate staffing levels.

B.7.1 System 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 actions and decisions of pilots to respond to the needs of industry.

Key risks identified include:

- Long assignments with sporadic or brief rest periods that may not be aligned with the pilot's sleep cycle, increasing fatigue and risking the safe navigation of the ship.
- Abbreviated mandatory rest periods to avoid delays, increasing fatigue and risking the safe navigation of the ship.
- Extended overland travel by pilots, especially after long assignments, risking pilot safety.
- Detention of pilots for convenience to the ship, consuming pilot capacity and increasing the risk of delay or compounding the first two risks identified.

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

B.7.2 Long Assignments in Area 6

The Director has already approved two pilots on long transits on a case-by-case basis in Area 6. Codifying in the association working rules the criteria District 3 will use in determining the safety of the situation will allow for analysis of the frequency of occurrences, estimation of additional pilot costs, and the inclusion of those costs within the rates.

As seen from **Table B-18: 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.

Three alternatives are presented to mitigate this risk of long assignments in Area 6:

- **Alternative 1:** Allow District 3 to determine when a second pilot should be retained on the vessel, and capture guidance in that decision in the association working rules. Clarify in the association working rules retention or assignment of an additional pilot for long transits.
- **Alternative 2:** Mandate two pilots on long legs, establishing a watch rotation between the pilots.
- **Alternative 3:** Establish an additional pilot change point.

Example cost estimations 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 and summarized in **Table B-26: Example Pilot Change Demand.**

Table B-26: 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	33.3	1,532
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
Total Transits	**89**		**2,788**

A full cost-benefits analysis is recommended. A comparison of costs is provided in **Table B-27: 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 includes a conservative estimate for the operating expenses for the pilot boat but does not include the cost of acquiring the 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 B-27: Pilot Change Point/Additional Pilot Cost Comparison

	Alternative 1 Pilot Boat Station	**Alternative 2 Additional Pilot**
2nd Pilot Travel to Location (hrs)	7	
1st Pilot Travel Back from Location (hrs)	7	
2nd Pilot Average Travel Time in Area 6 (from Pilot Cycle Table) (hrs) (**Table B-4**) (hrs)		3.7
Additional Administrative Time (hrs)	0.5	
2nd Pilot Mandatory Rest (hrs)	13	13
Pilot Capacity for 89 Occurrences in **Table B-26** (hrs)	2,448	1,486
2nd Pilot Transit Time for Season (**From Table B-26**) (hrs)		2,788
Total Pilot Capacity (hrs)	2,448	4,274
Additional Pilots (capacity 2,496 hours per pilot – **Table B-8 from seasonal work standard**)	0.98	1.71
Pilot Capacity Cost ($158,694 for Area 6 from 2013 FR)	$155,568	$271,683
Pilot Boat Operations	$220,000	
Estimated Annual Cost	**$375,568**	**$271,683**

Limited information is available on acceptable geography for a pilot station, cost of running a pilot boat, and frequency of occurrences. Should any of these alternatives be pursued, a more detailed cost-benefit analysis would be required

Recommendation:

- Update association working rules to provide, when safety dictates, the latitude for the pilots to assign or retain a second pilot onboard. Include a description on how rates for that additional pilot will be charged at a lower rate.
- Conduct a cost-benefit analysis for the cost of adding a pilot boat station for long transits in 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.

B.7.3 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 working rules are limited to changing the pilot out at night or for long transits.

For Area 1, modification to the working rules to allow more liberal pilot change at Iroquois Lock can address this matter. 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 **Appendix B.2** 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 per pilot to increase. The number of pilots needed in Area 1 may need to be increased depending on the amount of change to the average Pilot Assignment Cycle.

Recommendation:

- Adjust District 1 working 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 working 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 or not.

B.8 Net Revenue

Net revenue is the difference between revenue required and revenue generated. The ratemaking process estimates the revenue required based on operating expenses, compensation, and a return on investment. The rate multiplier is set within the ratemaking process to balance projected revenue to the required revenue. At the conclusion of the season, the difference between the revenue required and the revenue generated is the net revenue – a gap if generated revenue is lower than required revenue and a surplus if higher.

A revenue gap has been experienced. Closing the revenue gap will discourage practices aimed at achieving the target compensation rate that increase risks to safety and delays. In order to close the revenue gap, parameters used to estimate revenue required and projection of revenues generated must be aligned and made more accurate and stable. Currently the projection of revenue generated is based on a previous projection and not baselined to the actual revenue generated. Reducing or eliminating the revenue gap will mitigate many of the practices contributing to increased risks. The revenue gap adversely impacts investments in infrastructure, new technologies, and training and the ability to attract and sustain a highly qualified pilot pool.

To monitor and provide more visibility into the revenue gap, audits of pilot association revenues should be conducted in a similar manner and frequency to audits of operating expenses currently performed.

The following topics that contribute to closing the revenue gap have already been discussed:

- Using a hybrid historical average based on historical and one year of benchmarked projections to project demand (**Appendix B.3.1**)
- Restructuring baselining the tariff card to reflect current traffic volume and distribution (**Appendix B.4**)

B.8.1 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. Audit information received on expenses is typically lagging for two years or more.

For example, 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 estimated 2013 level.

Recommended Adjustment:

Apply an inflationary factor for each year from when the year expense audits were completed to the year of ratemaking projection.

B.8.2 The Projected Revenue Calculation

*Note: Re-baselining the tariff card (**Appendix B.4.2**) will eliminate the need for this calculation.*

Currently, 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.

An issue arises from projecting revenue on an estimate from the previous year, which may be inaccurate. The average revenue generated for a particular assignment can be determined from past data and should be used as the starting point for projecting revenue generated in the future.

With the recommended transition to assignments instead of hours, the same calculation is performed, but with the "per assignment" units instead of "per hour." 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.

The recommended process for re-baselining the tariff card in **Appendix B.4.2** compensates for the factors of traffic distribution and revenue required and can be used in lieu of a projected average hourly revenue generated calculation.

A comparison of the estimated value to the actual value is provided in **Table B-28: 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, resulting in a revenue gap.

Table B-28: 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	$2,348,516	$417.73	4,743	$1,981,302	($367,214)
	Area 2	$298.99	5,650	$1,689,246	$287.85	5,072	$1,459,963	($229,283)
D2	Area 4	$196.19	7,320	$1,436,140	$325.39	3,498	$1,138,214	($297,926)
	Area 5	$519.86	5,097	$2,649,876	$505.27	3,379	$1,707,321	($942,555)
D3	Area 6	$199.12	11,606	$2,311,006	$191.02	10,796	$2,062,238	($248,768)
	Area 7	$495.52	3,259	$1,614,974	$484.33	1,577	$763,791	($851,183)
	Area 8	$193.71	9,830	$1,904,237	$265.42	3,741	$992,928	($911,309)
	Totals		**47,965**	**$13,953,995**		**32,806**	**$10,105,757**	**($3,848,238)**

Recommended Adjustment:

- Use the most recent set of revenue and assignment data available to calculate the projected revenue in Step 3 and Step 3.a of the Appendix A methodology.

Baselining the tariff card as discussed in **Appendix B.4.2** already compensates for the ratio of projected revenue required and estimated revenue generated, so this calculation would not be necessary if that adjustment is implemented.

B.8.3 Rate Multiplier Calculations

*Note: Re-baselining the tariff card (**Appendix B.4.2**) will eliminate the need for this calculation.*

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 pilotage rates take place. If the projected ROI is less than the target ROI, then the ratio is greater than 1 and the rates increased. Conversely, if the projected ROI is greater than the target ROI, the ratio is less than 1 and the rates reduced.

This approach confuses the issues of ROI and the rate multiplier. As discussed in **Appendix B.5,** it is recommended that ROI calculation simply be applied to a percentage of the Investment Base, included as part of the necessary revenue to recover. Distinguishing the rate multiplier calculation from ROI will separate the processes of estimating required revenue and projecting revenue generated. 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.

Modifying the rate multiplier calculation as depicted in **Figure B-6: Clearer Presentation of Rate Multiplier Calculation** clarifies the calculation and makes its purpose more visible**.** The rate multiplier, in this context, is a direct ratio of the rate per assignment necessary to the current rate per assignment. If the rate per assignment necessary is higher than the current rate per assignment, the ratio is greater than 1, and pilotage rates will need to be increased to balance revenue required and revenue projected. If lower, the rates can be reduced. All components of the calculation are necessary to account for differences in revenue and demand between the year being referenced and the ratemaking year.

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 estimated average revenue per assignment for 2012. This is compared to the projected average revenue per assignment for 2013.

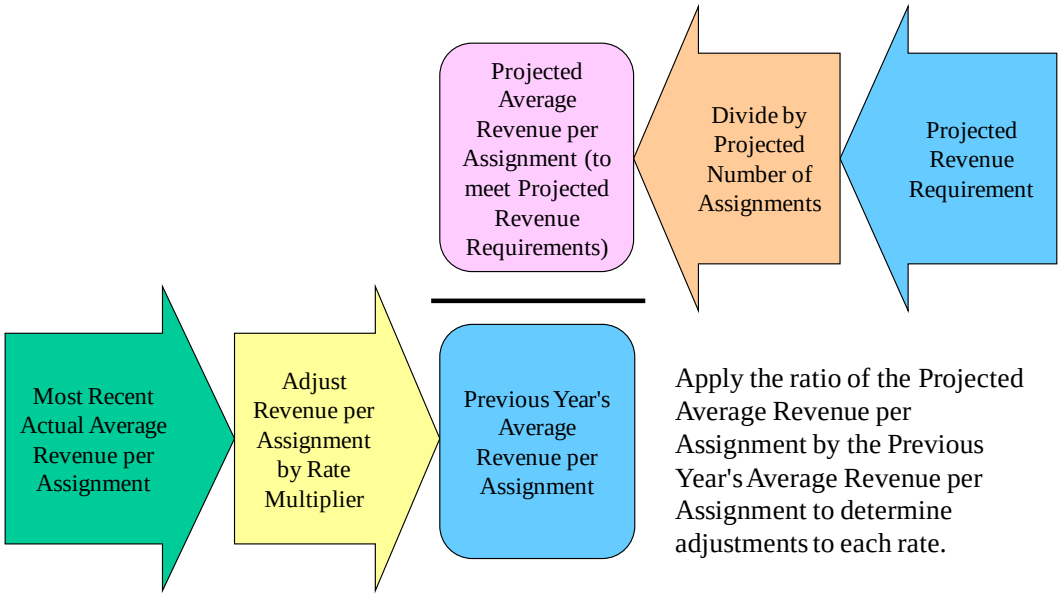

Figure B-6: Clearer Presentation of Rate Multiplier Calculation

Recommended Adjustments:

- Simplify the calculation for determining a rate multiplier to distinguish ROI as an expense and the projected revenue generated to meet required revenue. This will also reduce the perception that ROI is related to profit of the associations.
- Directly relate the rate multiplier to the ratio of two average revenue-per-hour rates – a rate necessary to generate revenue required and the previous year's rate.

Baselining the tariff card as discussed in **Appendix B.4.2** already compensates for the ratio of previous demand to projected demand, so this calculation would not be necessary if that adjustment is implemented.

B.9 Ratemaking Benchmarks

Several of the inputs to the ratemaking methodology are highly sensitive and subjective, with minor variations causing large changes in the final rate. Variations in these sensitive inputs also result in rate fluctuations, reducing industry's ability to plan and budget.

Establishing benchmarks increases the objectivity and reduces the volatility of these parameters. When a benchmark is not available annually, a benchmarked escalation factor should be applied for each year not available to retain objectivity.

Previous benchmarks have already been discussed:

- The rate of ROI in **Appendix B.5,** continuing the use of Moody's Seasoned Aaa Corporate Bond indicator.
- Pilot Compensation in **Appendix B.6,** having pilots and industry discuss a reasonable rate, with the Federal Pilots compensation rate as the most direct comparison.

B.9.1 Inflationary Factor

As discussed in **Appendix B.8.1,** multiple years of the inflation factors should be applied to the audited operating expenses for each year from when the audits were taken to the year of ratemaking.

- Continue use of the CPI-U for the overall Midwest Region of the United States.
- For the partial year during the ratemaking process, take the most recently published monthly figures.
- To project inflation into the ratemaking year, take an average over the past three years.

B.9.2 Great Lakes Economic Forecast

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.[33] Sources of nationwide economic forecast indicators are also available.[34] 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 is influenced predominantly by the inclusion of the two years' previous historical traffic.

B.10 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

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

[34] 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.

workforce are not visible or structured within the current ratemaking process to promote investments in proficiency.

B.10.1 Structured Training Programs

Training supports the sustainment of qualifications and pilot proficiency. It provides opportunities to be exposed to best practices and the application of evolving technology to increase efficiency and reduce risks.

Training is an allowable operating expense, but the delay in reimbursement, time-value of money, and revenue gap do not promote the incurred expense. The current ROI process only addresses infrastructure investments, not training.

Most recurring training can be conducted during the off-season. The pilot utilization factor discussed in **Appendix B.2** allows for limited training during the season.

The GLPA has recently instituted a formal training program, with an estimated cost of $500K over five years for all pilots. The program is structured to provide training to pilots on a five-year cycle. Consideration for shared expense between the pilots and recouped from industry should be reflected in those rules.

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.
  - Recommended recurring training courses include:
    - Bridge Simulator Training (or an equivalent manned model training)
    - Rapid Radar Plotting
    - Electronic Navigation
    - Standards of Training, Certification and Watchkeeping (STCW)
    - Bridge Resource Management
    - Legal Aspects of Piloting
- Adequately reflect the time-value of money for association expenses, and apply an inflation adjustment from the year of the audited training expenses to the year of the ratemaking.
- Document the sharing of training expenses in the association working rules.

B.10.2 Recruitment and Retention

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

positions has decreased. Hiring perspective pilots without Great Lakes experience lengthens the training period, increases costs, and impacts pilot capacity.

Although pay is reported as a leading issue, other significant issues including stability of pay, a mismatch in working expectations, quality of life, and living standards. Key issues 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.

Recommendation:

Conduct an evaluation of recruitment issues to develop strategies to address the concerns noted 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 and completeness of Coast Guard standards** to ensure well-qualified pilots are recruited and reduce the necessary training/qualification periods for new pilots.

B.11 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 and foreign vessels drive the 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.

The following sections discuss governance structures to increase the transparency and clarity of the overall ratemaking process and improving investment in infrastructure, new technology and training. The governance structures assist in the management of the ratemaking methodology.

B.11.1 Association Working Rules

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

association will follow, as well as establish expectations on the efficiency of providing pilotage services. They provide visibility into rules governing pilot operations and dispatch.

Pilot working rules have evolved and adapted to better fit the current operations on the Great Lakes and provide efficient pilotage services to industry. The working rules for the pilot associations need to be updated to reflect these modifications and expanded to be more complete. A collection of assumptions regarding pilot rest, travel, and time off were necessary to compensate for the many assertions that were made regarding working rules but not reflected in documentation or the data that was analyzed. The conflict between the currently approved working rules and the working practices of the pilot associations leads to ambiguity in the assumptions and analysis. Many of the issues expressed by stakeholders can be clarified and addressed immediately through up-to-date working rules.

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 in the working rules:

- Make the association working rules a matter of public record.
- Increase consistency across the associations where variations in operating conditions do not require a variance in the working rules.
  - The number of scheduled days off each month and which month scheduled time off occurs.
  - Rest periods as well as mandatory rest associated with cancellations and movages.
- Update the working rules either on a regular basis (once every five years) or when pilot practices are modified.
- Clarify the rules for implementing double pilotage.
- Document the working 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 or additional pilots on long transits.
- Document practices of pilot changes or retention for long transits:
  - Pilot change point at Iroquois Lock.
  - Pilots on long transits in Area 6.
- Document the roles, responsibilities, and activities to manage complete and accurate information within the Klein system.
- Document any additional pilot compensation, such as any allowances for travel.
- Document training programs and the sharing of expenses between pilot associations and recouped through the rate.
- Document conditions under which a pilot can be recalled from scheduled days off, additional charges to industry, and additional compensation to the pilot in these circumstances.
- Evaluate the cost/benefit of the use of a livery service and the working rule for District 3

allowing pilots 30 minutes rest for every hour driven on lengthy travel. Take into consideration pilot fatigue (both before and after the pilot assignment) and consumption of pilot capacity.

B.11.2 Ratemaking Governance and Review Process

The current ratemaking process is initiated by the Coast Guard providing estimates that balance revenue required to revenue generated through a systematic process. Adjustments to the process are permitted at the discretion of the Director. A preliminary ruling is provided to the public for comment. The Coast Guard then provides a final rule in response to the comments.

The GLPAC provides recommendations based upon discussion between pilot and industry representatives. Interactions within this process are limited and parochial and typically based on a response to a ruling rather than participation in the actual rule.

This approach is frequently contentious and makes achieving consensus among stakeholders challenging. A more collaborative and involved approach to the process will significantly increase the understanding and transparency of the process. Involvement by stakeholders early in the process reduces the role of the Coast Guard to resolving unsettled conflicts rather than being in a position of creating the conflict.

Similar to how rates are set for state pilot associations in Delaware, New York, and Alabama, a dual-layered recommendation and approval process should be considered for implementation. This will increase stakeholder interaction in developing proposed rate modifications. Modifications to rates, staffing standards, or compensation levels are initiated from the stakeholders and informally discussed among themselves before entering into a formal approval process. These discussions would be nonbinding and be carried out in a forum free from regulatory oversight. Because of the initial vetting of the proposal by the stakeholders, GLPAC will have more insights into the issues presented and be able to provide a more informed and timely recommendation to the Coast Guard. The Coast Guard would still retain the formal review, approval, and adjudication process.

A methodology to objectively calculate rates is continued (similar to the Appendix A ratemaking methodology). Each stakeholder desiring to make an adjustment must 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 approach, depicted in **Figure B-7: Example Ratemaking Process Responsibilities,** opens communications among stakeholders and improves transparency and understanding of the process.

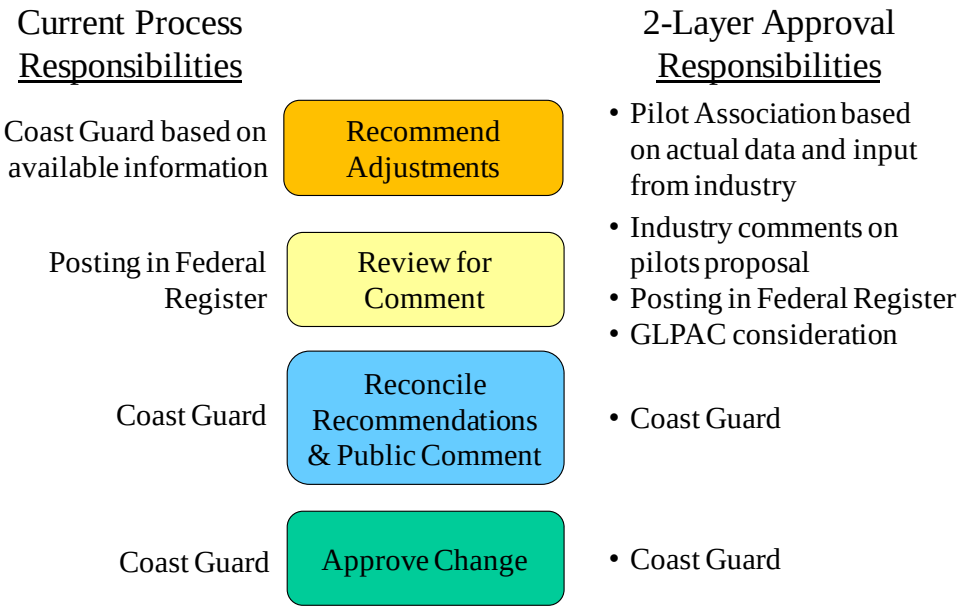

Figure B-7: Example Ratemaking Process Responsibilities

Recommendation:

- Adjust the current ratemaking development and review process to a two-stage approach with recommended modifications to rates initiated by the pilots:
  - Any recommendations to modify the output of the methodology are put forth by the pilots, developed from discussions among the stakeholders (both U.S. and Canada); that recommendation is endorsed (either positive or negative) by industry, and GLPAC provides a recommendation.
  - Final review and approval is provided by the Coast Guard.
- Pilot associations publish annual statistics, similar to those presented in the GLPA Annual Reports, to increase the transparency of the process (e.g., expense and revenue summary, assignment statistics; performance measures [delays, groundings, etc.], compensation).

B.11.3 Business Risk Reserve

Motivation for investment in infrastructure, new technologies, and training is currently limited to the ROI pilot associations receive on their recognized capital investments. This small amount of return does not provide sufficient capital or motivation for associations to make investments. The value of the ROI is also eroded by the application of only a single year's inflationary factor.

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 current ratemaking process establishes rates so that the estimated revenue required can be exactly generated if demand is as expected. There is no component to reflect the variability in demand and the risk to business in anticipating and responding to that demand. This places all of the risk in not reaching demand on the pilots. This risk should be shared between pilots and industry. Pilots could reduce their numbers to reduce the impact on compensation but this would increase the risk of delays to industry and safety of the system. Not realizing projected demand is a risk that should be shared among stakeholders.

The Business Risk Reserve can be included as an additional expense reflected in the rates. It is a designated percentage of both operating expenses and pilot compensation; not just the investment base. Because expenses are inclusive, the Business Risk Reserve would replace the ROI as shown in **Figure B-7: Business Risk Reserve**. The Business Risk Reserve provides a buffer against excessively low demand to reduce the loss experienced by the association. When projected demand is not realized, reduction in the Business Risk Reserve can be realized before impacting pilot wages. It will also provide a mechanism for associations to set aside funds when projected demand is reached or exceeded.

The Business Risk Reserve is 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. Annual audits will continue to provide visibility into any revenue gaps or surplus and provide an indicator as to whether the Business Risk Reserve rate is too high.

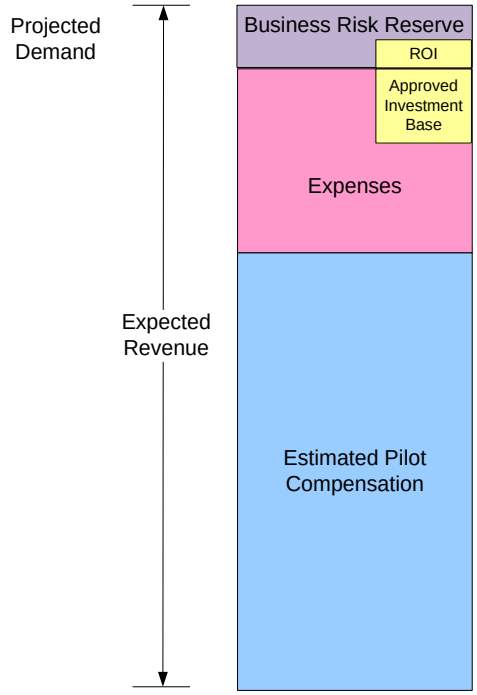

Figure B-7: Business Risk Reserve

An alternative approach to minimize the risk to the pilot associations would be to establish a program where any revenue gap or surplus from the audited year is considered in the next

ratemaking cycle – increasing the rates to recover a gap and reducing the rates if a revenue surplus occurred. An annual review of audits provides visibility and validation of costs. This alternative approach:

- Does not provide an incentive for associations to improve the efficiency of operations.
- Transfers all of the business risk to industry.
- Affects the stability of the rates and reduces predictability.

Recommendation:

- Replace the current ROI with the Business Risk Reserve.
- Base the Business Risk on estimated expenses and pilot compensation applying Moody's Seasoned Aaa Corporate Bond Yield.
- Audit revenue generated by the associations in a similar manner expenses are currently audited to monitor the rate of the Business Risk Reserve

B.11.4 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 makes delivery of services more effective. What was observed during the visits to the pilot associations was the commitment of individuals to provide these services. Local knowledge and efficiency of processes stemmed from this commitment. Effectiveness will still rely on the commitment of the individual, regardless of whether the services are provided locally or shared across Districts.

Current technologies overcome geographical limitations and can improve through automated processes, billing, and dispatch. Pilot boat services and travel are still constrained by geography and are not suitable for centralized services.

Billing

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

The associations will have concerns regarding accounting functions being performed that should not be shared across associations. This can 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 pilots better informed of upcoming assignments, decrease the amount of time spent monitoring traffic, and improves 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 **Appendix B.2.** Travel and Mandatory Rest should be distinct times recorded in the Klein system.

A single 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 is expected 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 is impractical to centralize.

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

Recommendation:

Any improvements from shared services are anticipated to be marginal and should be pursued without a more in-depth cost-benefit analysis. The following actions will mitigate experienced shortfalls:

- Use the billing capabilities of Klein to automate billing procedures. Leveraging these billing processes to improve the accuracy, completeness, and consistency of the information in the Klein system will realize a large portion of the gain of shared billing services.
- Billing and dispatch could be considered for consolidation. However, the gain in efficiency is considered negligible. Pilot boat services and travel are still constrained by geography and are not suitable for centralized services. A recommended review of overland travel within District 3 is discussed as part of the update to association working rules in **Appendix B.11.1.**

B.11.5 Klein System Information

More-accurate and timely information on actual pilot operations increases objectivity, supports the recommended adjustments within this report, and will enhance 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 pilots' quality of life and their ability to plan personal events.

Many associations maintain a separate collection of statistics and do not pay attention to the accuracy of the information within the Klein system. Inconsistent use of the Klein system also contributes to increased difficulty in analyzing issues associated with Great Lakes pilotage – stakeholders draw from a different set of data not visible to the others in order to leverage their position.

Recommendation:

Recommendations to improve the completeness, consistency, and accuracy of information within the Klein system in support of analysis include:

- Establish procedures within each association's working rules on the entry, management, and verification of information within the Klein system.
- 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, to ensure the information within the Klein system is complete, accurate, and consistent.
- 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 consumption of pilot capacity corresponding to the terminology provided in **Appendix B.1: Clarifying Terminology** and all of the components to calculate the standards discussed in **Appendix B.2** (e.g., pilot boat travel, mandatory rest). This may require additional records in the Klein system, but it would provide a record of the consumption of pilot capacity.
- Enter a notation and reason code into the Klein system whenever a pilot's participation on the Tour de Role is changed to support identifying how often pilots are recalled from Scheduled Days Off.
- 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.

APPENDIX C. SUPPORTING DATA

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.

When processing the Klein system data:

- Delay and Detention hours were subtracted from recorded bridge hours. From the data, the time recorded under "Bridge Time" was inclusive of Delay and Detention time. 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).

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**		
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**		
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

Transit Code	Occurrences	Minimum	Maximum	Average	Std. Dev.
MVG2	30	0.3	4.5	1.7	1.0
Area 4 Totals:	**328**	**1.0**	**25.6**		
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	190	1.0	25.6	12.4	2.2
SES-ASH	8	5.0	6.9	6.2	0.7
SES-CLE	41	2.6	20.0	4.4	3.7
Marked Invalid	2				
MVG4	14	1.0	2.2	1.6	0.3
Area 5 Totals:	**601**	**0.3**	**34.0**		
DET-B12	33	5.3	29.7	7.6	4.3
DPB-B12	220	2.7	30.8	6.6	2.0
SES-DET	38	2.0	6.9	5.1	0.9
SES-DPB	168	2.3	34.0	5.3	2.4
SES-TOL	35	0.7	26.5	5.6	4.1
TOL-DET	16	3.3	9.7	7.1	1.6
TOL-DPB	41	2.2	9.5	6.0	1.7
Marked Invalid	9[35]				
MVG5	41	0.3	7.0	1.7	1.2
Area 6 Totals:	**458**	**0.8**	**133.5**		
B12-DTR	157	6.6	20.8	14.1	2.4
B12-GBUSO	46	24.5	103.1	33.3	13.3
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	90	20.5	133.5	44.8	16.6
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

[35] Two of the nine are movages.

Transit Code	Occurrences	Minimum	Maximum	Average	Std. Dev.
TOB-LITT	1	4.9	4.9	4.9	N/A
Marked Invalid	5				
MVG6	29	0.8	29.1	4.7	6.9
Area 7 Totals:	**223**	**1.3**	**36.1**		
B33-DTR	179	4.8	36.1	7.3	3.0
B33-SOO	11	1.5	25.8	6.1	6.9
DTR-SOO	29	3.8	31.2	8.5	4.8
Marked Invalid	1				
MVG7	3	1.3	3.5	2.6	1.2
Area 8 Totals:	**228**	**0.9**	**93.9**		
B33-DUL	123	1.4	93.9	22.7	8.4
B33-TUN	52	6.8	22.6	13.9	3.9
DUL-TUN	7	12.5	24.7	17.3	4.4
Marked Invalid	4				
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**	**0.5**	**15.9**		
IRO-CVC	179	3.8	11.8	6.6	1.0
SNL-CVC	228	8.2	15.9	10.7	1.2
SNL-IRO	180	1.1	6.3	4.5	0.7
Marked Invalid	1				
MVG1	3	0.5	2.1	1.3	0.8
Area 2 Totals:	**516**	**0.0**	**44.3**		
CVC-OSW	1	4.6	4.6	4.6	n/a
CVC-PWL	291	0.0	23.0	10.7	2.1
CVC-WON	113	6.5	44.3	14.1	4.3
IRO-CVC	2	5.0	17.1	11.0	8.3
OSW-PWL	1	8.8	8.8	8.8	n/a
PWL-WON	73	0.0	6.3	3.0	1.1
WON	3	4.0	5.0	4.5	0.5
WON-ROC	1	9.5	9.5	9.5	n/a
Marked Invalid	11[36]				
MVG2	20	0.5	5.8	1.7	1.2
Area 4 Totals:	**461**	**0.0**	**62.0**		
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

[36] Four of the 11 are movages.

Transit Code	Occurrences	Minimum	Maximum	Average	Std. Dev.
PCO-CLE	56	9.8	48.5	14.2	6.8
PCO-ERI	7	5.0	28.9	10.0	8.6
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
Marked Invalid	1				
MVG4	25	0.0	24.8	3.3	6.3
Area 5 Totals:	**821**	**0.1**	**31.5**		
DET-B12	24	4.5	31.5	7.5	5.3
DPB-B12	302	2.5	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	41	1.3	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
Marked Invalid	5[37]				
MVG5	127	0.1	5.8	1.3	1.1
Area 6 Totals:	**549**	**0.3**	**121.3**		
B12-BAY	2	22.5	28.8	25.6	4.4
B12-DTR	230	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

[37] Three of the five are movages.

Transit Code	Occurrences	Minimum	Maximum	Average	Std. Dev.
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
Marked Invalid	2				
MVG6	15	0.3	3.8	2.2	1.0
Area 7 Totals:	**337**	**0.7**	**32.5**		
B33-DTR	260	5.5	32.5	7.2	2.0
B33-SOO	17	-0.7	7.9	3.1	1.9
DTR-SOO	44	4.1	31.6	8.2	4.8
Marked Invalid	6				
MVG7	10	2.6	27.2	6.1	7.4
Area 8 Totals:	**352**	**0.8**	**170.3**		
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
Marked Invalid	1				
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:	**360**	**0.5**	**31.0**		
CVC-OSW	4	4.3	5.5	4.8	0.5
CVC-PWL	209	6.8	31.0	11.2	2.2
CVC-WON	77	8.1	19.7	13.4	1.9
PWL-WON	49	0.8	10.5	3.4	1.8
WON	3	5.3	8.3	6.6	1.5
Marked Invalid	4				
MVG2	14	0.5	7.2	2.8	1.8
Area 4 Totals:	**292**	**0.0**	**37.6**		
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

Transit Code	Occurrences	Minimum	Maximum	Average	Std. Dev.
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
Area 5 Totals:	**470**	**0.2**	**52.8**		
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
Marked Invalid	2				
MVG5	35	0.2	3.1	1.3	0.7
Area 6 Totals:	**352**	**-4.3**	**72.5**		
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	1	7.6	7.6	7.6	n/a
MILW-GBUSO	1	6.8	6.8	6.8	n/a
Marked Invalid	2				

Transit Code	Occurrences	Minimum	Maximum	Average	Std. Dev.
MVG6	11	0.8	19.3	4.0	5.1
Area 7 Totals:	**276**	**0.5**	**29.7**		
B33-DTR	187	2.8	29.7	6.9	2.1
B33-SOO	8	1.9	3.0	2.3	0.4
DTR-SOO	35	4.0	29.4	6.9	4.2
Marked Invalid	35				
Area 8 Totals:	**231**	**0.9**	**67.1**		
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
Marked Invalid	3[38]				
MVG8	33	0.9	14.1	5.2	5.1

Table C-4: 2008 Transit Statistics

Transit Code	Occurrences	Minimum	Maximum	Average	Std. Dev.
Area 1 Totals:	**632**	**0.0**	**42.0**		
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**	**0.1**	**33.5**		
CVC-PWL	273	7.0	33.5	11.2	2.7
CVC-WON	110	10.0	28.8	13.6	2.3
PWL-WON	81	0.6	7.9	3.3	1.2
WON	2	3.5	4.0	3.8	0.4
Marked Invalid	1				
MVG2	14	0.1	2.6	1.5	0.6
Area 4 Totals:	**444**	**0.0**	**36.3**		
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

[38] One of the three are movages.

Transit Code	Occurrences	Minimum	Maximum	Average	Std. Dev.
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
Area 5 Totals:	**616**	**0.4**	**30.5**		
DET-B12	15	5.0	7.8	6.3	0.6
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
Marked Invalid	1				
MVG5	19	0.4	10.8	3.0	3.3
Area 6 Totals:	**424**	**1.1**	**79.8**		
B12-BRIT	3	18.5	24.0	20.8	2.8
B12-DTR	193	5.3	21.3	14.2	2.6
B12-GBUSO	47	12.6	36.5	25.6	4.2
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	5	3.0	11.5	6.0	3.3
Marked Invalid	4[39]				
MVG6	13	-11.1	46.5	4.4	13.2
Area 7 Totals:	**311**	**-11.3**	**32.3**		
B12-DTR	1	0.7	0.7	0.7	n/a
B33-DTR	251	2.2	31.4	7.3	3.6
B33-SOO	6	0.8	4.3	2.4	1.4
DTR-SOO	40	3.7	32.3	7.7	5.3

[39] One of the six are movages.

Transit Code	Occurrences	Minimum	Maximum	Average	Std. Dev.
Marked Invalid	8				
MVG7	4	0.9	1.8	1.4	0.4
Area 8 Totals:	**251**	**0.3**	**86.0**		
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
Marked Invalid	2[40]				
MVG8	31	0.3	4.2	2.1	0.9

[40] Two are movages.

An overall summary of Tables C-1 through C-4 is provided in **Table C-5: Summarized Averaged Transit Times**. The aggregate average transit time for each transit is determined only from valid assignments and does not include movages. **Table C-6: Summarized Delays and Detentions** provides a count of occurrences of delay and the total delay experienced. The average delay per transit is determined by dividing the total delay by the number of transits including those transits that were marked invalid (i.e., if a transit took place but the data was corrupted, it was counted as a transit). Similarly, **Table C-7: Summarized Travel** provides statistics on travel. For District 3, supplemental travel data was provided. For all other Districts information within the Klein system was used.

Table C-5: Summarized Averaged Transit Times.

Year	Area	Valid Transits	Invalid Transits	Average Transit Time (hrs)		Year	Area	Valid Transits	Invalid Transits	Average Transit Time (hrs)
2011	Area 1	631	0	7.4		2009	Area 1	431	0	7.7
2011	Area 2	470	0	10.5		2009	Area 2	342	4	10.5
2011	Area 4	312	2	11.0		2009	Area 4	282	0	11.1
2011	Area 5	551	9	6.0		2009	Area 5	433	2	6.1
2011	Area 6	424	5	25.1		2009	Area 6	339	2	21.2
2011	Area 7	219	1	7.4		2009	Area 7	230	35	6.7
2011	Area 8	182	4	20.0		2009	Area 8	195	3	21.5
2010	Area 1	587	1	7.6		2008	Area 1	611	0	8.1
2010	Area 2	485	11	10.3		2008	Area 2	466	1	10.4
2010	Area 4	435	1	11.7		2008	Area 4	416	0	10.6
2010	Area 5	689	5	6.1		2008	Area 5	596	1	6.0
2010	Area 6	531	2	22.7		2008	Area 6	408	4	21.1
2010	Area 7	321	6	7.2		2008	Area 7	298	8	7.2
2010	Area 8	265	1	24.6		2008	Area 8	218	2	20.3
						4-Year Mean	**Area 1**	**565**	**0**	**7.7**
							Area 2	**441**	**4**	**10.4**
							Area 4	**361**	**1**	**11.1**
							Area 5	**567**	**4**	**6.1**
							Area 6	**426**	**3**	**22.5**
							Area 7	**267**	**13**	**7.1**
							Area 8	**215**	**3**	**21.6**

Table C-6: Summarized Delays and Detentions

Year	Area	Total Delay (hrs)	Delay Events	Average Delay Per Transit (hrs)	Year	Area	Total Delay (hrs)	Delay Events	Average Delay Per Transit (hrs)
2011	Area 1	379	84	0.6	2009	Area 1	167	60	0.4
2011	Area 2	408	108	0.9	2009	Area 2	267	116	0.8
2011	Area 4	215	79	0.7	2009	Area 4	168	87	0.6
2011	Area 5	194	55	0.4	2009	Area 5	164	47	0.4
2011	Area 6	436	58	1.0	2009	Area 6	350	54	1.0
2011	Area 7	101	13	0.5	2009	Area 7	20	7	0.1
2011	Area 8	864	120	4.7	2009	Area 8	482	72	2.5
2010	Area 1	387	111	0.7	2008	Area 1	739	98	1.2
2010	Area 2	445	155	0.9	2008	Area 2	456	164	1.0
2010	Area 4	235	80	0.5	2008	Area 4	331	156	0.8
2010	Area 5	362	66	0.5	2008	Area 5	252	87	0.4
2010	Area 6	506	62	1.0	2008	Area 6	338	49	0.8
2010	Area 7	63	10	0.2	2008	Area 7	100	18	0.3
2010	Area 8	707	85	2.7	2008	Area 8	720	103	3.3
					4-Year Mean	**Area 1**	418	88	**0.7**
						Area 2	394	136	**0.9**
						Area 4	237	101	**0.7**
						Area 5	243	64	**0.4**
						Area 6	407	56	**1.0**
						Area 7	71	12	**0.3**
						Area 8	693	95	**3.3**

Table C-7: Summarized Travel

Year	Area	Total Travel	Average Travel Per Transit (hrs)		Year	Area	Total Travel	Average Travel Per Transit (hrs)
2011	Area 1	1,613	2.6		2009	Area 1	1,259	2.9
2011	Area 2	1,853	3.9		2009	Area 2	1,519	4.4
2011	Area 4	1,905	6.1		2009	Area 4	796	2.8
2011	Area 5	2,054	3.7		2009	Area 5	474	1.1
2011	Area 6	813	1.9		2009	Area 6	339	1.0
2011	Area 7	315	1.4		2009	Area 7	384	1.7
2011	Area 8	309	1.7		2009	Area 8	326	1.7
2010	Area 1	1,757	3.0		2008	Area 1	1,936	3.2
2010	Area 2	1,663	3.4		2008	Area 2	1,906	4.1
2010	Area 4	845	1.9		2008	Area 4	2,469	5.9
2010	Area 5	476	0.7		2008	Area 5	2,175	3.6
2010	Area 6	918	1.7		2008	Area 6	701	1.7
2010	Area 7	305	1.0		2008	Area 7	434	1.5
2010	Area 8	560	2.1		2008	Area 8	414	1.9
					4-Year Mean	**Area 1**	1,641	**2.9**
						Area 2	1,735	**4.0**
						Area 4	1,504	**4.2**
						Area 5	1,295	**2.3**
						Area 6	693	**1.6**
						Area 7	360	**1.4**
						Area 8	402	**1.8**

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 for each day is indicated along the y-axis; the specific day is indicated along the x-axis. If the assignment spans two days, the assignment is 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. A scheduling of 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.

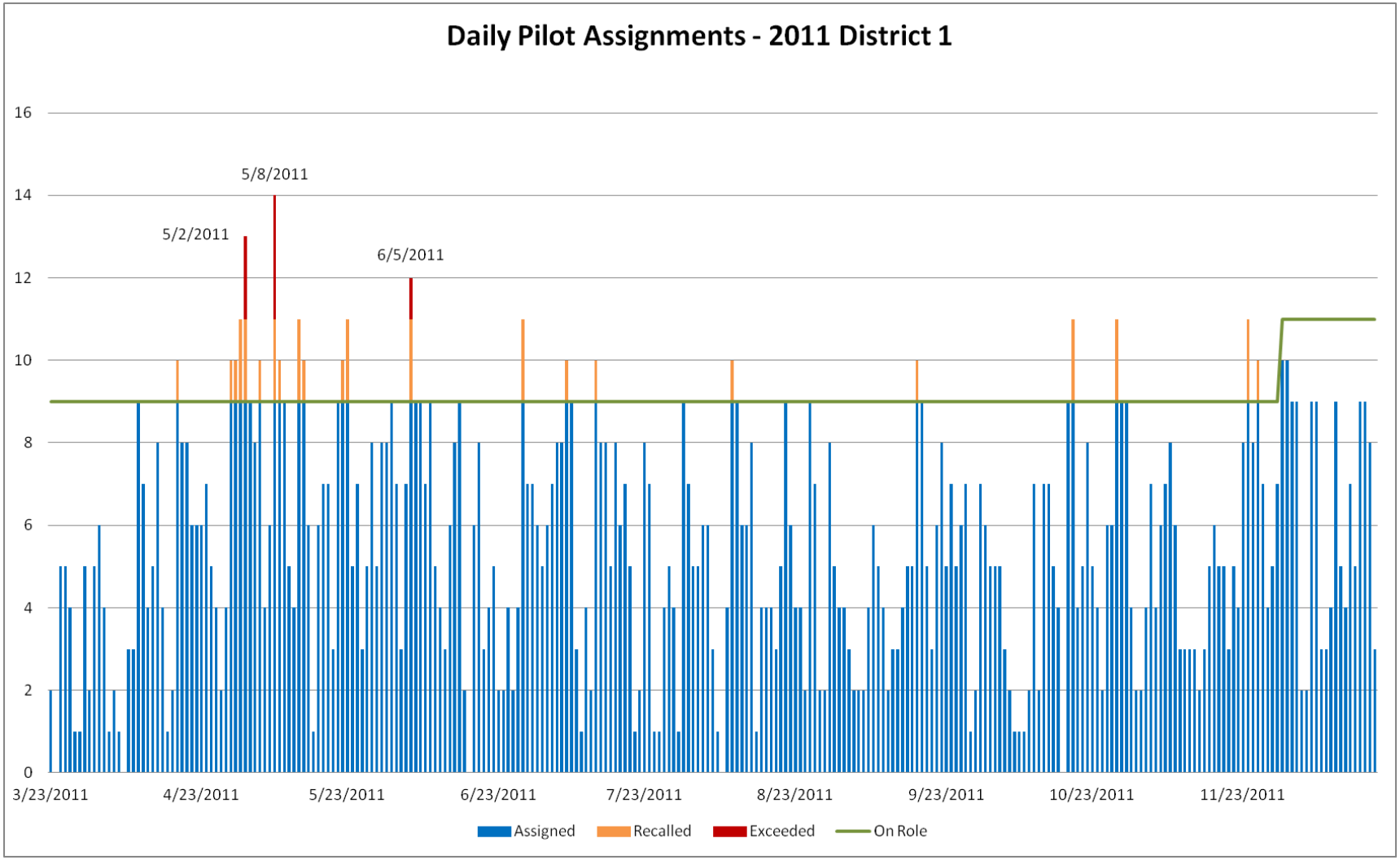

Figure C-1: 2011 District 1 Daily Pilot Assignments

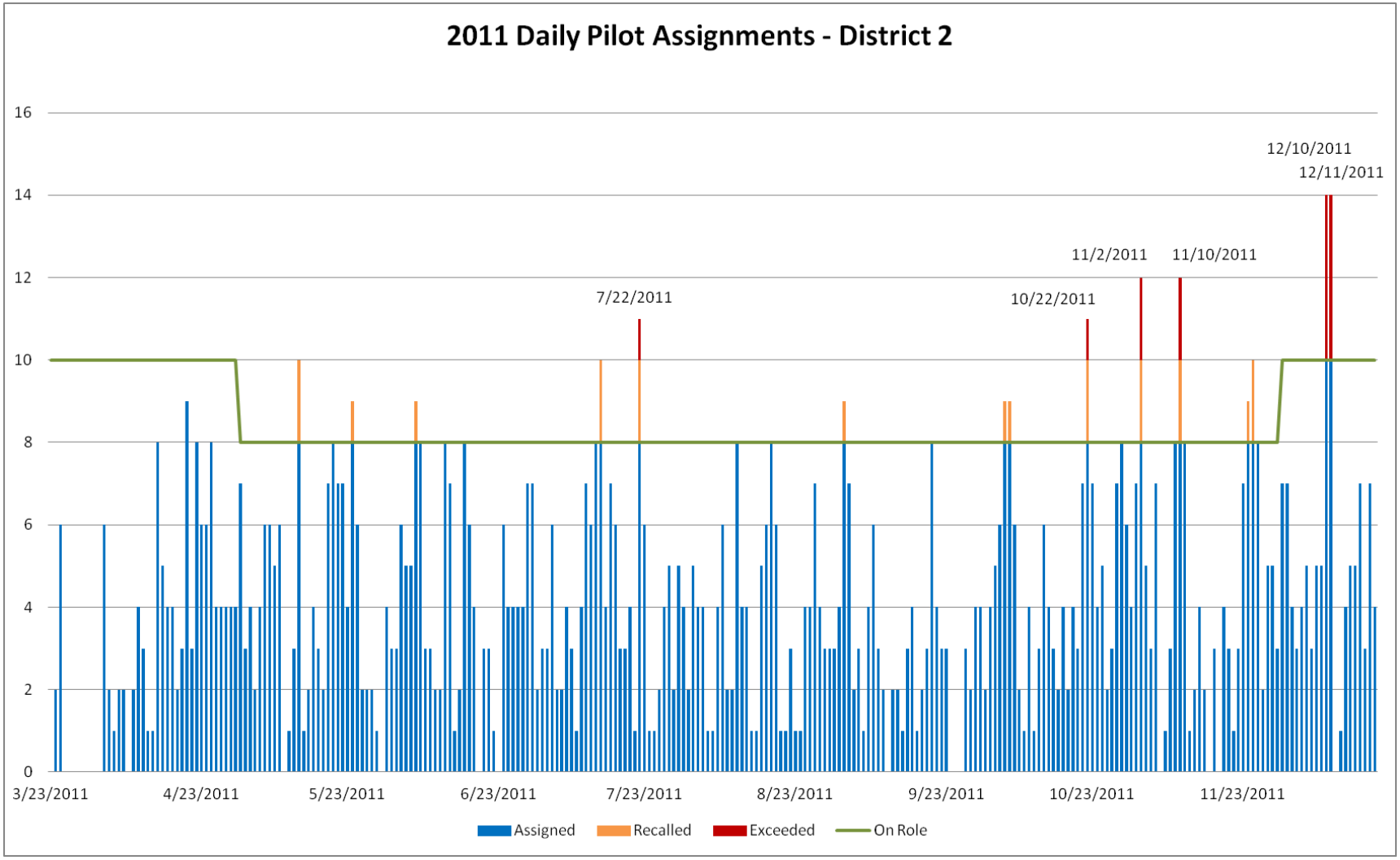

Figure C-2: 2011 District 2 Daily Pilot Assignments

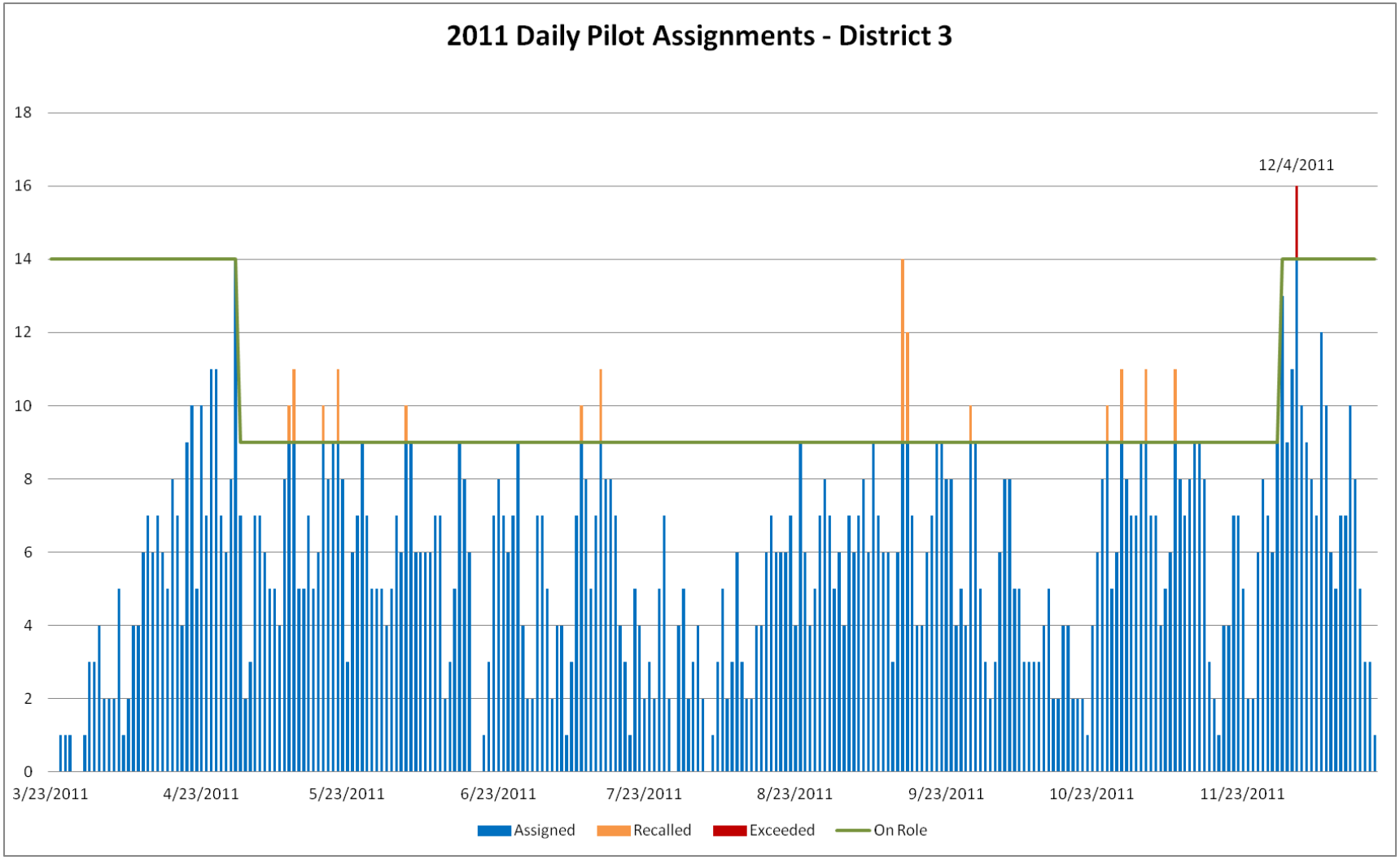

Figure C-3: 2011 District 3 Daily Pilot Assignments

C.4 Pilot Trip Statistics

The pilot work statistics are displayed in **Table C-8: 2011 Pilot Work Statistics** through **Table C-11: 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-8: 2011 Pilot Work Statistics

Area	Pilot	2011 Trips	2011 Bridge Hours w/ DDC	2011 Trip Time (hrs)
Area 1	Pilot 1A	107	871	788
	Pilot 1B	91	729	695
	Pilot 1C	109	890	828
	Pilot 1D	105	801	765
	Pilot 1E	111	899	828
	Pilot 1F	108	853	792
Total for Area 1		**631**	**5,043**	**4,696**
Area 2	Pilot 1A	1	16	15
	Pilot 1G	22	262	252
	Pilot 1H	114	1,236	1,150
	Pilot 1C	2	26	26
	Pilot 1I	113	1,222	1,161
	Pilot 1J	112	1,289	1,174
	Pilot 1K	106	1,257	1,148
Total for Area 2		**470**	**5,307**	**4,926**
Area 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	589	557
	Pilot 2G	25	318	318
	Pilot 2H	22	253	253
	Pilot 2I	43	415	364
	Pilot 2J	44	475	435
Total for Area 4		**312**	**3,617**	**3,418**

Area	Pilot	2011 Trips	2011 Bridge Hours w/ DDC	2011 Trip Time (hrs)
Area 5	Pilot 2A	64	412	397
	Pilot 2B	67	393	388
	Pilot 2C	52	378	335
	Pilot 2D	74	458	449
	Pilot 2E	77	473	436
	Pilot 2F	32	216	176
	Pilot 2G	69	436	428
	Pilot 2H	73	519	504
	Pilot 2I	23	129	124
	Pilot 2J	20	113	97
Total for Area 5		**551**	**3,527**	**3,333**
Area 6	Pilot 3A	36	932	841
	Pilot 3B	18	470	468
	Pilot 3C	45	1,334	1,300
	Pilot 3D	16	321	321
	Pilot 3E	16	391	352
	Pilot 3F	47	1,001	987
	Pilot 3G	37	1,139	1,033
	Pilot 3H	39	988	961
	Pilot 3I	34	764	741
	Pilot 3J	42	1,253	1,202
	Pilot 3K	40	1,099	1,058
	Pilot 3L	10	212	212
	Pilot 3M	42	1,164	1,157
	Pilot 3N	2	27	27
Total for Area 6		**424**	**11,097**	**10,661**
Area 7	Pilot 3B	41	296	278
	Pilot 3C	6	30	30
	Pilot 3D	50	371	363
	Pilot 3E	44	366	355
	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**	**1,677**	**1,613**

Area	Pilot	2011 Trips	2011 Bridge Hours w/ DDC	2011 Trip Time (hrs)
Area 8	Pilot 3A	25	624	563
	Pilot 3B	6	145	126
	Pilot 3C	15	361	290
	Pilot 3D	4	71	64
	Pilot 3F	15	351	265
	Pilot 3G	16	405	313
	Pilot 3H	21	539	427
	Pilot 3I	22	545	426
	Pilot 3J	15	391	293
	Pilot 3K	15	366	299
	Pilot 3L	8	210	202
	Pilot 3M	16	380	265
	Pilot 3N	4	118	109
Total for Area 8		**182**	**4,505**	**3,641**
Grand Total		**2,789**	**34,774**	**32,288**

Table C-9: 2010 Pilot Work Statistics

Area	Pilot	2010 Trips	2010 Bridge Hours w DDC	2010 Trip Time (hrs)
Area 1	Pilot 1A	95	777	707
	Pilot 1B	97	836	763
	Pilot 1C	101	855	778
	Pilot 1D	94	753	701
	Pilot 1E	101	775	738
	Pilot 1F	99	829	749
Total for Area 1		**587**	**4,825**	**4,437**
Area 2	Pilot 1A	13	175	148
	Pilot 1H	118	1,269	1,123
	Pilot 1L	126	1,430	1,328
	Pilot 1M	4	41	32
	Pilot 1B	13	145	136
	Pilot 1C	14	152	150
	Pilot 1D	13	133	130
	Pilot 1I	116	1,318	1,222
	Pilot 1J	44	497	458
	Pilot 1E	13	157	147
	Pilot 1F	11	113	113
Total for Area 2		**485**	**5,432**	**4,987**

Area	Pilot	2010 Trips	2010 Bridge Hours w DDC	2010 Trip Time (hrs)
Area 4	Pilot 2A	52	673	653
	Pilot 2B	48	602	597
	Pilot 2C	21	267	260
	Pilot 2D	29	407	404
	Pilot 2E	35	478	468
	Pilot 2F	58	653	600
	Pilot 2G	31	382	382
	Pilot 2H	38	476	468
	Pilot 2I	60	746	684
	Pilot 2J	63	631	563
Total for Area 4		**435**	**5,314**	**5,080**
Area 5	Pilot 2A	84	599	568
	Pilot 2B	81	535	487
	Pilot 2C	66	502	457
	Pilot 2D	89	562	534
	Pilot 2E	88	551	532
	Pilot 2F	41	292	238
	Pilot 2G	86	570	540
	Pilot 2H	85	585	516
	Pilot 2I	37	232	198
	Pilot 2J	32	164	159
Total for Area 5		**689**	**4,591**	**4,229**
Area 6	Pilot 3A	40	1,099	1,054
	Pilot 3I	33	825	819
	Pilot 3B	54	1,287	1,258
	Pilot 3C	23	438	438
	Pilot 3D	41	952	951
	Pilot 3E	52	1,120	1,113
	Pilot 3F	30	678	674
	Pilot 3G	56	1,472	1,427
	Pilot 3H	23	748	729
	Pilot 3I	61	1,535	1,299
	Pilot 3J	27	457	414
	Pilot 3K	41	830	793
	Pilot 3L	41	921	888
	Pilot 3M	9	198	198
	Pilot 3N	52	673	653
Total for Area 6		**531**	**12,560**	**12,054**

Area	Pilot	2010 Trips	2010 Bridge Hours w DDC	2010 Trip Time (hrs)
Area 7	Pilot 3A	5	31	31
	Pilot 3I	52	364	350
	Pilot 3B	7	41	41
	Pilot 3C	61	469	465
	Pilot 3D	40	348	340
	Pilot 3E	15	85	85
	Pilot 3F	4	27	27
	Pilot 3G	3	20	20
	Pilot 3H	5	37	37
	Pilot 3I	10	72	72
	Pilot 3J	60	402	400
	Pilot 3K	48	384	352
	Pilot 3L	7	47	45
	Pilot 3M	4	32	32
	Pilot 3N	321	2,359	2,297
Total for Area 7		**321**	**2,359**	**2,297**
Area 8	Pilot 3A	10	409	392
	Pilot 3I	20	416	370
	Pilot 3B	15	472	407
	Pilot 3C	10	245	234
	Pilot 3D	34	767	714
	Pilot 3E	16	351	310
	Pilot 3F	19	548	434
	Pilot 3G	21	683	598
	Pilot 3H	25	629	559
	Pilot 3I	18	492	476
	Pilot 3J	7	232	207
	Pilot 3K	34	982	888
	Pilot 3L	16	480	465
	Pilot 3M	5	31	31
	Pilot 3N	52	364	350
Total for Area 8		**265**	**7,234**	**6,527**
Grand Total		**3,313**	**42,315**	**39,611**

Table C-10: 2009 Pilot Work Statistics

Area	Pilot	2009 Trips	2009 Bridge Hours w DDC	2009 Trip Time (hrs)
Area 1	Pilot 1A	73	534	517
	Pilot 1B	68	606	586
	Pilot 1C	79	558	542
	Pilot 1D	64	537	514
	Pilot 1E	75	629	608
	Pilot 1F	72	610	541
Total for Area 1		**431**	**3,474**	**3,307**
Area 2	Pilot 1H	80	843	791
	Pilot 1L	79	907	840
	Pilot 1M	81	938	857
	Pilot 1N	31	328	313
	Pilot 1I	70	814	765
	Pilot 1F	1	14	10
Total for Area 2		**342**	**3,843**	**3,576**
Area 4	Pilot 2A	29	380	363
	Pilot 2B	30	361	361
	Pilot 2C	5	71	68
	Pilot 2D	18	234	234
	Pilot 2E	33	457	438
	Pilot 2F	35	369	329
	Pilot 2G	24	296	293
	Pilot 2H	27	339	337
	Pilot 2I	39	362	331
	Pilot 2J	42	438	386
Total for Area 4		**282**	**3,306**	**3,138**
Area 5	Pilot 2A	50	338	326
	Pilot 2B	34	244	228
	Pilot 2C	57	352	346
	Pilot 2D	60	385	334
	Pilot 2E	21	121	103
	Pilot 2F	56	355	343
	Pilot 2G	55	394	374
	Pilot 2H	21	122	110
	Pilot 2I	20	107	104
	Pilot 2J	73	534	517
Total for Area 5		**433**	**2,794**	**2,630**
Area 6	Pilot 3A	36	724	640
	Pilot 3B	6	90	90
	Pilot 3C	36	809	766
	Pilot 3O	45	979	954

Area	Pilot	2009 Trips	2009 Bridge Hours w DDC	2009 Trip Time (hrs)
	Pilot 3D	9	209	199
	Pilot 3E	10	214	214
	Pilot 3F	38	753	731
	Pilot 3G	37	809	803
	Pilot 3H	39	1,109	1,061
	Pilot 3I	4	58	58
	Pilot 3J	30	701	641
	Pilot 3K	4	95	95
	Pilot 3P	12	297	277
	Pilot 3L	2	22	22
	Pilot 3M	31	681	649
Total for Area 6		**339**	**7,549**	**7,199**
Area 7	Pilot 3A	5	28	28
	Pilot 3I	41	265	265
	Pilot 3B	8	43	43
	Pilot 3C	7	39	39
	Pilot 3O	35	255	252
	Pilot 3D	37	274	274
	Pilot 3E	4	12	12
	Pilot 3F	3	19	19
	Pilot 3G	3	44	44
	Pilot 3H	3	19	19
	Pilot 3I	2	13	13
	Pilot 3J	39	265	259
	Pilot 3K	4	27	23
	Pilot 3P	38	257	249
	Pilot 3L	1	7	7
	Pilot 3M	36	724	640
Total for Area 7		**230**	**1,567**	**1,546**
Area 8	Pilot 3A	26	703	650
	Pilot 3I	2	40	39
	Pilot 3B	21	468	438
	Pilot 3C	22	465	426
	Pilot 3O	1	4	4
	Pilot 3E	22	447	415
	Pilot 3F	20	487	385
	Pilot 3G	16	361	294
	Pilot 3H	11	330	329
	Pilot 3I	26	618	555
	Pilot 3J	1	24	24
	Pilot 3K	5	119	113
	Pilot 3P	16	459	372
	Pilot 3L	6	157	157

Area	Pilot	2009 Trips	2009 Bridge Hours w DDC	2009 Trip Time (hrs)
	Pilot 3M	26	703	650
Total for Area 8		**195**	**4,682**	**4,201**
Grand Total		**2,252**	**27,214**	**25,599**

Table C-11: 2008 Pilot Work Statistics

Area	Pilot	2008 Trips	2008 Bridge Hours w DDC	2008 Trip Time (hrs)
Area 1	Pilot 1A	104	1,009	847
	Pilot 1B	99	968	822
	Pilot 1C	105	857	799
	Pilot 1D	101	1,069	883
	Pilot 1E	105	946	860
	Pilot 1F	97	859	758
Total for Area 1		**611**	**5,707**	**4,968**
Area 2	Pilot 1H	95	1,115	1,003
	Pilot 1L	90	1,018	948
	Pilot 1M	92	1,037	930
	Pilot 1N	95	1,029	946
	Pilot 1I	93	1,081	999
	Pilot 1E	1	8	5
Total for Area 2		**466**	**5,288**	**4,832**
Area 4	Pilot 2A	40	488	458
	Pilot 2B	32	387	379
	Pilot 2C	17	200	188
	Pilot 2D	32	382	369
	Pilot 2E	36	441	429
	Pilot 2F	62	640	573
	Pilot 2G	41	465	456
	Pilot 2H	38	451	439
	Pilot 2I	59	637	572
	Pilot 2J	59	660	557
Total for Area 4		**416**	**4,752**	**4,421**
Area 5	Pilot 2A	75	500	487
	Pilot 2B	69	427	407
	Pilot 2C	56	402	374
	Pilot 2D	75	519	482
	Pilot 2E	68	418	401
	Pilot 2F	36	229	200
	Pilot 2G	71	413	387
	Pilot 2H	83	521	499
	Pilot 2I	34	228	188

Area	Pilot	2008 Trips	2008 Bridge Hours w DDC	2008 Trip Time (hrs)
	Pilot 2J	29	177	157
Total for Area 5		**596**	**3,834**	**3,582**
Area 6	Pilot 3A	37	806	745
	Pilot 3I	9	187	187
	Pilot 3C	37	867	845
	Pilot 3O	41	873	858
	Pilot 3D	5	119	119
	Pilot 3E	5	81	78
	Pilot 3F	38	847	825
	Pilot 3Q	6	89	83
	Pilot 3G	37	840	825
	Pilot 3H	38	912	885
	Pilot 3I	14	315	307
	Pilot 3R	19	384	351
	Pilot 3J	39	845	775
	Pilot 3K	8	140	140
	Pilot 3P	34	833	811
	Pilot 3L	7	155	155
	Pilot 3M	34	658	624
Total for Area 6		**408**	**8,949**	**8,611**
Area 7	Pilot 3A	6	37	34
	Pilot 3B	58	421	418
	Pilot 3C	3	47	35
	Pilot 3O	6	46	41
	Pilot 3D	49	386	382
	Pilot 3E	47	373	358
	Pilot 3F	3	15	15
	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	3	18	13
	Pilot 3K	54	399	383
	Pilot 3P	2	26	19
	Pilot 3L	48	335	327
	Pilot 3M	2	13	13
Total for Area 7		**298**	**2,257**	**2,157**
Area 8	Pilot 3A	24	574	512
	Pilot 3I	8	191	155
	Pilot 3B	2	39	39
	Pilot 3C	13	254	227
	Pilot 3O	19	444	392

Area	Pilot	2008 Trips	2008 Bridge Hours w DDC	2008 Trip Time (hrs)
	Pilot 3D	5	138	127
	Pilot 3E	2	77	61
	Pilot 3F	15	334	271
	Pilot 3Q	7	263	257
	Pilot 3G	15	322	247
	Pilot 3H	18	397	326
	Pilot 3I	9	208	184
	Pilot 3R	17	404	369
	Pilot 3J	23	526	422
	Pilot 3K	2	40	40
	Pilot 3P	13	284	249
	Pilot 3M	22	534	449
	Pilot 3N	4	125	109
Total for Area 8		**218**	**5,155**	**4,435**
Grand Total		**3,013**	**35,942**	**33,006**

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, chemicals, 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 Cargo Value (million $)	Shipping Weight (kilograms)	Calculated 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**