Final Report

BC SHIPBUILDING & REPAIR WORKFORCE TABLE
LABOUR MARKET RESEARCH AND ANALYSIS PROJECT

Prepared for
BC Shipbuilding & Repair Workforce Table

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EXECUTIVE SUMMARY

This report was prepared on behalf of the BC Shipbuilding & Repair Workforce Table. The Committee was established in fall 2011 for the purpose of developing a human resource strategy to meet the current and future needs of the British Columbia's Shipbuilding & Repair Industry. Support for this project was provided through the Resource Training Organization (RTO) and the Canada-BC Labour Market Development Agreement.

In October 2011, the federal government announced the results of the National Shipbuilding Procurement Strategy (NSPS), identifying Seaspan Marine Corporation (British Columbia) as one of the successful proponents on the federal government's $33 billion program to construct combat and non-combat vessels for the federal government over the next 20 years. Seaspan was awarded the rights to construct non-combat vessels of over 1,000 tonnes, an agreement that will eventually see $8 billion in shipbuilding contracts. Early estimates suggested that the NSPS program would inject billions into the provincial economy and create an average of 4,000 direct and indirect jobs for the province.

In early 2012, R.A. Malatest & Associates Ltd. was contracted by the Table to develop employment estimates and occupational projections associated with the $8 billion NSPS award through 2020, and to undertake a training and skills gap analysis to inform future workforce planning. Highlighted below are the key findings associated with the research completed in May 2012. The information is based on labour market information from Statistics Canada, primary survey research involving public and commercial shipyard operators, suppliers of services, equipment and materials, and consultation with industry stakeholders.

Industry Overview

- Manufacturing revenues for the commercial Shipbuilding & Repair industry averaged $265 million between 2004 and 2010. Maintenance, repair and refits to existing vessels have been the primary business activities for shipyard operators in BC.
- The commercial industry is comprised of one large shipbuilding and repair operator, as well as several smaller operators located in the Lower Mainland and Vancouver Island/Coast.
- Between 2006 and 2011, employment among commercial shipyard operators averaged 2,003 workers. The majority of the workforce is comprised of skilled trades workers, including "marine" trades (e.g., shipwright, marine fitter) and "traditional" trades workers (e.g., pipefitters, metal fabricators, millwrights).

Investment Outlook

Planned investments in BC's Shipbuilding & Repair industry are estimated at $9.9 billion between 2012 and 2020, transforming the industry into a $billion per year entity over this period. The majority (68%) of this planned investment is dedicated to the new build program under the NSPS. At its peak, industry revenues from public and private investments could reach $1.4 billion in 2018.

Between 2012 and 2020:

- Total investment in new build construction is estimated at $6.75 billion (68%);
- Total investment in vessel maintenance and repair is estimated at $2.0 billion (20%);
- Total investment in vessel refit is estimated at $593.0 million (6%); and
- Total investment in in-service support contracts is estimated $503.0 million (5%).

Research Findings

In February/March 2012, the consultant conducted a survey of public and commercial employers, and labour organizations that supply workers to the Shipbuilding & Repair industry. The survey yielded 20 responses from a sample of approximately 40 employers and unions. Employers who responded to the survey accounted for more than 85% of the industry workforce.

Current & Projected Workforce

- the total industry workforce is estimated at 3,198 workers, two-thirds of which are employed by commercial shipyard operators;
- the industry workforce is dominated by workers employed in traditional (66%) and marine trades (14%);
- nearly three-quarters (73%) of the current workforce possesses either a post secondary education or training credential;
- the current vacancy rate for the industry is 3.1%, with engineering technologists & technicians having the highest reported vacancy rate (24.4%) among all identified occupations;
- industry employment is projected to increase by 47% over the next four years (4,701 workers), and by a total of 62% (5,189 workers) through 2020;
- more than three-quarters (77%) of the current workforce is at least 40 years of age, including 30% who are 55 years or older;
- 422 workers (13%) are expected to retire by 2016 and a 846 by 2020 (26%), yielding an annual retirement rate of 3.3% through 2020;
- based on economic growth and replacement demand, 1,926 job openings are projected by 2016 and a total of 2,838 job openings through 2020;
- traditional and marine trades occupations are projected to experience the largest number of job openings through 2020.

Associated Workforce – Other Plate & Fabrication

Local businesses operating in the Other Plate & Fabrication manufacturing sector are major suppliers to BC's Shipbuilding & Repair industry, providing metal fabrication services and products. Many of the workers employed in this sector require skills and training similar to the shipbuilding and repair workforce. As shipbuilding expands over the next decade, expectations are such that this sector will also grow and that demand for workers will commensurately increase.

- based on secondary statistics, employment in the Other Plate & Fabrication sector for the Lower Mainland and Vancouver Island/Coast was estimated at 1,429 workers in 2012;
- trades workers account for close to half (48%) of the sector workforce; workers in processing and manufacturing occupations account for 21%;
- based on the province's Input-Output model, employment for the sector is projected to increase steadily over the next decade, peaking at 2,954 workers by 2018, as a result of planned investments in the Shipbuilding & Repair industry;
- based on economic growth and replacement demand due to retirements, 957 job openings are projected by 2016 and a total of 1,399 by 2020.

The combined number of projected job openings for both Shipbuilding & Repair and Other Plate & Fabrication (i.e., industry cluster) is 2,883 by 2016 and 4,237 by 2020. More than two-thirds of projected job openings will occur in the next five years.

Supply Projections – BC Labour Market Scenario Model

The BC Labour Market Scenario Model (BCLMSM) is a provincial forecasting model that provides supply and demand projections for individual occupations throughout British Columbia's eight economic regions. BCLMSM supply projections were analysed against projected job openings in high demand occupations within BC's Shipbuilding & Repair industry (Lower Mainland & Vancouver Island/Coast). Based on this model, skills gaps are projected in all occupations through 2016 and 2020, with the largest gaps projected in the traditional and marine trades. Analysis of training and education outcomes (i.e., unemployed graduates) and other sources of labour, including intraprovincial, interprovincial and international migrants, was undertaken to assess their potential in filling projected skills gaps.

High Demand Occupations	Job Openings 2012-2020	Gap 2012-2016	Gap 2017-2020
Supervisor, Trade & Related Workers	135	(45)	(76)
Machinist	34	(17)	(10)
Pipefitters & Sprinkler Installers	223	(167)	(48)
Plumber	55	(27)	(24)
Electrician (Industrial)	227	(168)	(50)
Electrician (Construction)	49	3	(42)
Welder (A/B)	451	(268)	(165)
Painter	66	(30)	(33)
Millwright	21	(12)	(5)
HD Mechanic	31	(19)	(10)
Machine Fitter	118	(88)	(18)
Mechanical Engineering (T&T)	32	(14)	(13)
Electrical/Electronic Engineering (T&T)	28	(16)	(8)
Manufacturing Manager	8	(3)	(4)
Purchasing Manager	7	(4)	(3)
Construction / Project Manager	31	(19)	(10)
Program Manager	11	(10)	(1)
Procurement, Logistics & Material Management	45	(26)	(10)
Job Estimating	25	(19)	(4)
Quality Assurance	33	(18)	(9)
Planning & Scheduling	39	(23)	(12)
Planning & Scheduling	39	(23)	(12)
Marine Fitter	293	(180)	(105)
Marine Engine Mechanic	110	(73)	(32)
Shipwright	56	(25)	(28)
Sand Blaster	88	(43)	(43)

Training Gaps & Outcomes Analysis

Employers identified BC's industry training system as the most important source of labour to the industry. With the exception of engineering Technicians & Technologists, employers felt that the identified sources of labour were adequately meeting their needs *at this time*, yet problems were evident recruiting marine trades workers and specialized workers, including production management and critical function & support specialists. A review of apprenticeship programming suggests that while the province's industry training system has some capacity to expand programming to help meet future demands for skilled trades workers in BC's Shipbuilding & Repair industry, there will also be competing demands from other industries for the same apprentices. Significant growth is forecast for industries such as Mining and Oil & Gas which will lead to competition among industries for similarly skilled workers and will challenge employers to recruit an adequate supply of skilled trades workers to meet future requirements. The planned construction of several major capital projects will further exacerbate the demand for skilled workers. The demands for skilled trades workers will strain the industry training system's ability to provide sufficient training opportunities

for BC industries. Changes to the traditional apprenticeship model, including innovative delivery and sponsorship models, could help ensure that the Shipbuilding and Repair industry can take advantage of economies of scale within the traditional training system. Outside of the traditional trades, skills gaps will persist in those occupations currently not supported by some type level of formal training or education programming.

Marine Trades

- There are currently no apprenticeship training programs available with specific application to the "marine" trades. Marine trades workers often rely on traditional trades training in related programs to help prepare them for employment. Employers indicated that formal industry training in support of the marine trades is needed to help alleviate succession planning challenges and to meet ongoing workforce requirements. Skills shortages are projected to be highest in those occupations where training programs are lacking or do not exist.
- With the exception of marine fitters, projected job openings in the other marine trades could, in part, be met by graduates (i.e., unemployed outcomes) of related apprenticeship training programs. For example, marine fitters trained through the province's metal fabrication apprenticeship program, or shipwrights trained as joiners or carpenters. Wider use of these training programs and targeted recruitment of graduates would be enhanced through program developments (e.g., marine endorsement) aimed at the shipbuilding and repair industry. It was also noted that some effort should be placed on providing training to existing construction trades to facilitate their entry into the marine construction / repair sector.

Production Management / Critical Function & Support Specialists

- Employers identified the growing need for production management training with a marine focus. Specific training gaps identified included planning, estimating, purchasing and costing. Existing public training programs that support these functions are not marine specific and are rarely engaged by employers. Employers suggested the best method for addressing this gap is to develop management upgrading to allow experienced workers to acquire the skill sets needed to become effective mid-management production workers.
- Examination of outcomes from existing programs suggests that annual job openings may be filled by graduates in programs applicable to higher level management occupations (e.g., manufacturing managers and purchasing managers). Greater difficulty is anticipated filling projected job openings in more specialized occupations, such as job estimating, materials management, quality assurance and planning related occupations. All employers indicated difficulty filling these critical function occupations, as competition for these skills spans multiple competing industries.

Professional Engineers / Technologists & Technicians

- Employers indicated that current skills shortages were highest in technologist and technician occupations. BC post secondary institutions offer a range of technologist and technician programs with application to the Shipbuilding & Repair industry. While larger employers are becoming more reliant on these workers, most indicated that a mechanical engineering technology program specific to the marine industry would be a valued development for the industry.

- An examination of training capacity and program outcomes of mechanical and electrical technology and technician programs in BC suggests the system has capacity to produce sufficient graduates to meet industry requirements (notwithstanding competition from other industries). Currently, there are a relatively high percentage of unemployed graduates, though many pursue further education and training after program completion. Given the growing importance of these programs to the Shipbuilding & Repair industry, developing a strengthened relationship with program providers and targeting graduates as a recruitment strategy will be needed to secure an adequate supply of these workers.

- Naval architects and engineers represent a small though highly coveted group of workers within the industry. BC post secondary institutions do not provide specific engineering programming in support of the marine sector, yet many graduates of related engineering programs find employment in the shipbuilding and repair industry. Employers often rely on program graduates from other Canadian post secondary institutions (e.g., Memorial University) or international recruits. Enhancing partnerships through co-op arrangements with Canadian post secondary institutions is a potential opportunity to help meet future requirements for these workers.

Traditional Skilled Trades

- Apprenticeship training programming is available through public and private institutions for all skilled trades throughout the province. For a number of years, apprenticeship training has been conducted on a limited basis in the industry, owing to economic uncertainty and a lack of new vessel construction. Employers cited the need for incorporating a marine component into trades training programs (i.e., endorsement). Employers further cited the need for targeted upgrading to transition experienced production workers into supervisory level positions.

- Annual skills gaps are identified in four of the nine select traditional trades, including supervisor, pipefitter and sprinkler installer, industrial electrician and machine fitter. Further examination of outcomes in the piping and electrical trades suggest that current gaps could, in part, be addressed by recently trained workers in related trades (i.e., construction electrician and plumber). With the exception of supervisor, which does not have an

associated training (upgrading) program, all other programs in support of the skilled trades have system capacity to expand programming (i.e., seats) to accommodate current demands. However, given increasing demand for similarly skilled workers from other industries, competition for training spaces is expected to intensify in the near term, contributing to skills shortages in shipbuilding and other industries. In this context, in the absence of an integrated training strategy, the industry will be at risk in terms of securing an adequate workforce due to lively completion from other construction sectors that are similarly poised to witness growth and expansion.

Other Sources of Labour

Aboriginal Workforce

Based on survey results, Aboriginal workers represent about 5% of the current industry workforce. A relatively high percentage of Aboriginal workers possess skills, training and formal qualifications relevant to high demand occupations in the Shipbuilding & Repair industry. Aboriginal Skills Employment & Training (ASET) agencies provide employment and training services to Aboriginal clients. There are several ASETs currently operating in the Lower Mainland and Vancouver Island/Coast whose members possess skills and experience applicable to the shipbuilding and repair industry.

Migrant Workforce

The shipbuilding and repair workforce is comprised largely of workers from the local population (78%), with an equal share of workers from other provinces (3%) and internationally (3%). Changes to the Provincial Nominee Program and Citizenship & Immigration Canada Skilled Worker Programs are being implemented to facilitate the entry of skilled workers in strategic occupations to Canada and the provinces.

Demand-Supply Gap Analysis (All Sources)

Employers in the Shipbuilding & Repair industry rely on various sources of labour in addition to those trained and educated through public and private training programs. Based on the projected supply of workers from all sources – including graduate outcomes and migrant workers from BC, Canada and internationally – results suggest that projected job openings in select occupations supported by formal training or education programs could be met through graduate outcomes and other sources.

However, this result assumes that a high percentage of recent graduates currently not working would make themselves available for employment in the Shipbuilding & Repair industry. As this is unlikely for myriad reasons, this result overestimates the potential of unemployed program graduates to assist in filling projected job openings. Further this conclusion does not factor in other significant risks associated with increasing competition for similarly skilled workers from other industries and jurisdictions. British Columbia, Alberta, as well as Washington State anticipate the demand for skilled workers will increase significantly in the coming decade, based on new capital

investments in construction, manufacturing, and the resource sector, that will attract skilled workers to regions outside the Lower Mainland and Vancouver Island/Coast. As a result, active participation and support for apprenticeship training, development of additional and innovative programming in support of marine trades and production management/critical function occupations, coupled with targeted recruitment of migrant workers in high demand occupations, will be required in the near term to help meet future skills gaps and to promote a sustainable industry workforce.

Recommendations

The following recommendations are put forward for consideration by the Table and include both a long term strategy to promote the development of a sustainable industry workforce and shorter term strategies to address specific occupational demands.

Establish an Industry Governance Body to Oversee Training and Labour Market Development Activities for BC's Shipbuilding & Repair Industry (2012)

- An Industry Governance Body (IGB) would be a standing committee, comprised of industry, government, labour and training representatives, responsible for guiding the development of all training and labour market initiatives on behalf of BC's Shipbuilding & Repair industry. This would include responsibility for developing a long term human resource strategy for the industry, focusing on attraction, recruitment and development of the future workforce, as well as identification of roles and responsibilities of industry partners and timelines for implementation. Support for the IGB would come from industry, and federal and provincial government agencies responsible for human resource development.
- Implementation and coordination of the strategy would be the responsibility of an administrative organization (e.g., IMTARC), which would also serve as the industry's linkage to training providers at the secondary and post secondary level, labour partners, and public agencies responsible for education and training development, including the Resource Training Organization and the Industry Training Authority. All activities flowing from the strategy would be coordinated by the implementing organization.

Develop and Implement a Human Resource Strategy for BC's Shipbuilding & Repair Industry (2013)

The IGB would be responsible for the development and ongoing oversight of the industry workforce strategy. Guiding principles for the development of the strategy would include:

- *Industry Leadership* – industry is the lynchpin to ensuring that the labour market needs of shipyard operators and supporting supply chain businesses are fully identified and addressed going forward. Success of the NSPS (and related future developments) will in large measure depend on industry's ability to implement effective strategies that meet the needs of business and the communities in which they serve.

- *Industry Wide Participation* – the NSPS provides the opportunity to transform BC's Shipbuilding & Repair industry into a modern and competitive enterprise, capable of building vessels and providing services beyond the current environment. Engaging all levels of operations including small, medium and large shipyards and suppliers will ensure the development of a comprehensive strategy where all interests are represented.

- *Integrated Strategy* - while the NSPS represents the largest investment in BC's Shipbuilding & Repair industry, it is not the only source of business for the industry. Workforce development evolves from an industry business strategy that is focused on productivity and competitiveness. Future training and labour market development opportunities must be constructed within the industry's broader business strategy.

- *Community Involvement* – members of the local community are the single most important source of labour to the industry, and serve as a key basis of support for future developments. Workforce development opportunities that target local communities, including members from Aboriginal and immigrant populations, can help promote long term sustainability and stability for the industry.

- *Commitment to Training and Workforce Development* – the NSPS provides industry the opportunity to plan and develop the workforce force for the long term. Although near term pressures are significant, new training and labour market initiatives must be developed in the context of industry's long term requirements. Once in place, it is industry's responsibility to support these programs and its participants in the long term.

Elements of the strategy would include:

- *Inform* – working with industry, education providers and community partners to inform and raise awareness of the benefits and career opportunities associated with BC's Shipbuilding & Repair industry;

- *Recruit* – focusing on local sources of new workers and experienced workers with skills and qualifications applicable to the industry, as well as migrants from other parts of BC, Canada and internationally to fill gaps in higher demand occupations;

- *Develop* – developing marine specific training and upgrading in support of entry-level, marine trades, production management and critical function occupations;

- *Retain* – company and industry initiatives that focus on promoting workers from within the industry, and other efforts to retain the existing workforce even during periods of slower economic activity.

Occupational Recommendations > Entry-Level Production

- Foundation programming and secondary school apprenticeships are available in most skilled trades relevant to the Shipbuilding & Repair industry. As a means of raising awareness and introducing new potential workers to the industry, incorporate workplace based training (e.g., internships) into foundation programming, while promoting the expansion of secondary school apprenticeships at the high school level. Develop a marine industry orientation program to familiarize potential recruits of the opportunities for training and development in the shipbuilding and repair industry.

Occupational Recommendations > Marine Trades

- Although there are no specific marine trades training programs at this time, each is closely related to one or more existing skilled trades programs. Efforts are currently underway to develop the marine fitter training program based on the existing metal fabrication apprenticeship program. Given projected demand for these skills from both the Shipbuilding & Repair industry and the Other Plate & Fabrication sector, training development and implementation should be expedited and possibly coordinated with this sector, and other sectors as applicable.

- Similar training developments are recommended for shipwrights and marine engine mechanics through the development of marine based modules in related training programs (i.e., joinery and millwright/HD mechanic) that prepare workers for employment in the marine environment.

Occupational Recommendations > Traditional Trades

- Expand the scope of training for traditional trades to include a marine option for work in a shipyard (i.e., marine environment). Develop this training option for the dual purpose of facilitating the recruitment of skilled workers with experience in other industries and jurisdictions.

- Develop formal upgrading programs to provide experienced trades workers with skills and knowledge to effectively transition into leadership roles, including supervisory and operations management. Examine the existing program model as developed for the building construction industry as provided through BCIT, in conjunction with that offered by the Fisheries & Marine Institute out of Newfoundland's Memorial University.

Occupational Recommendations > Professional Engineers, Technologist & Technicians

- Examine the potential for partnering with other Canadian training institutions for the provision of naval architecture, design services and knowledge transfer on an as-needed basis. Explore the potential for co-op or work placement opportunities for students in

existing Canadian programs, such as Newfoundland's Memorial University (Fisheries & Marine Institute) and Nova Scotia's Dalhousie.

- Approach Applied Technicians & Technologists Association of BC (ASTTBC) as to their interest in helping develop a marine option for existing mechanical and electrical technologist and technician programs at BCIT and Camosun College. Strengthen relationships with training providers to help promote career opportunities in the Shipbuilding & Repair industry for graduates of these programs.
- Approach the BC government to provide base funding for the development of marine options for existing programs.

Occupational Recommendations > Production Management / Critical Function & Support Specialists

- Pursue the development of targeted production management training programs with public and private training providers specific to the marine industry, encompassing critical functions such as planning, job estimating, purchasing, logistics, materials management, quality control, and quality assurance. Examine similar programs currently offered at BCIT (e.g., operations management and supervision) and Memorial University for application in the BC Shipbuilding & Repair industry.
- Approach professional organizations, such as the Project Management Institute (PMI) and the Institute for Certification in Production and Inventory Management (CPIM), for development and certification purposes.

SECTION 1: INTRODUCTION

Over the past three decades, shipbuilding in British Columbia and Canada has experienced a major transformation. For BC shipbuilders, the federal decision in the mid-1980s to suspend oil exploration in Canada's north put on hold the construction of new icebreakers on the west coast. Reduced government procurement following the completion of the Canadian Patrol Frigate Project in the mid-1990s contributed to an industry with excess capacity for the domestic market yet unable to compete with the emergence of low-cost international manufacturers mostly from Asia. As a result, BC's Shipbuilding & Repair industry experienced a prolonged period of uneven growth, with many shipyards having to downsize or consolidate, while focusing efforts on maintenance, repair and refit activities.

In the early 2000s, BC's Shipbuilding & Repair industry began to experience renewed activity, as new opportunities began to emerge from among private cruise operators, new coast guard vessel construction, submarine maintenance activities, and the expansion of the provincial ferry fleet. While refits and repair continued as the primary business activity for most shipyards, new ship construction also returned with the introduction of BC Ferries' Island Sky (Vancouver Shipyards) in 2009, as well as replacement vessels for Canada's Coast Guard and commercial vessels for operators serving the west coast. Manufacturing and repair activity remained brisk through 2008, at which time global economic conditions delayed new investments in the BC industry. In addition, BC has become Canada's centre of excellence for submarine repair. The technologies involved make submarine repair more complex than ship repair, requiring quality management systems that are more akin to those found in the aviation industry.

Today, industry optimism has returned with the federal announcement identifying Seaspan Marine Corporation as one of two successful bidders under the National Shipbuilding Procurement Strategy. This new build program has the potential to help renew the industry over the next generation and provide employers with the economic certainty needed to develop a stable and productive workforce to meet long term requirements.

Outlook for BC's Shipbuilding & Repair Industry

In October 2011, the federal government announced the results of the National Shipbuilding Procurement Strategy (NSPS), identifying Seaspan Marine Corporation (British Columbia) and Irving Shipbuilding (Nova Scotia) as the successful proponents on the federal government's $33 billion program to construct combat and non-combat vessels for the federal government (vice Coast Guard) over the next 20 years. Seaspan was awarded the rights to construct non-combat vessels over 1,000 tonnes for the federal government, an agreement that will eventually see $8 billion in shipbuilding contracts, starting with the construction of seven identified vessels. Irving Shipbuilding Inc. was awarded the rights to construct 21 combat vessels and arctic offshore patrol ships.

In February 2012, an umbrella agreement was finalized between the two successful proponents and the federal government defining administrative arrangements for negotiating future contracts. More recently in the March 2012 budget, the federal government committed $5.2 billion to the

construction of the new Canadian Coast Guard vessels (and helicopters), as well as to fund the repair and refit of existing vessels over the next 11 years.

In addition to the national program, the industry stands to benefit from several other important opportunities, including renewal of the BC Ferry fleet, construction of federal vessels less than 1000 tonnes, and increasing maintenance and repair activity in the cruise ship industry. With a fleet of 35 vessels, BC Ferries is one of the largest ferry operators in the world, providing year-round vehicle and passenger service on 25 routes. In June 2011, BC Ferries announced their intention to replace 26 vessels over the next 15 years and a total projected investment of $2.5 billion in new vessels and terminals.

Success in capitalizing on these opportunities will require a coordinated industry workforce strategy. A key element of this strategy must be to quickly introduce measures to ensure that there are sufficient numbers of skilled workers to execute the business. It is estimated that the NSPS program over the next 8 years will inject billions into the provincial economy and create an average of 4,000 direct and indirect jobs in the province[1]. Other estimates suggest that, at its peak, industry employment could expand to more than 5,000 workers near the end of the decade, an increase of more than 150%.

Shipbuilding & Repair Industry Workforce Table

Following the federal government's NSPS announcement, BC industry stakeholders established the *Shipbuilding & Repair Industry Workforce Table* (Table) to undertake a human resource study to help address future workforce requirements. Under the leadership of Capt (N) Alex Rueben with representation from public and private employers, provincial and federal government agencies, post secondary institutions and unions, the Table was tasked with confirming the overall human resource requirements associated with the $8 billion new build program and developing a coordinated workforce strategy in support of the industry through 2020 and beyond.

The mandate of the Table is to:

- Confirm the overall human capital requirements associated with the recent $8 billion National Shipbuilding Procurement Strategy (NSPS) contract award and other significant projects and activities in the sector;
- Review labour supply projections/sources and existing and planned training and other related programs and initiatives to identify opportunities and gaps; and
- Develop a coordinated workforce strategy that will, in part, inform private and public investments in labour market programs needed to support the sector.

Membership of the Table (Appendix A) includes the combined membership of the existing Industrial Marine Training & Applied Research Centre (IMTARC) Committee and the BC Shipbuilding & Repair Human Resources Committee ("HR Committee"), with representation from the BC Ministries of Advanced Education (AVED) and Jobs, Tourism & Innovation (JTI) and senior representatives from the

[1] MNP Consulting. Economic Impacts of Expanded Shipbuilding Operations in BC, 2011
[2] As data results of the secondary survey were insufficient to develop an employment baseline for industry suppliers,

post-secondary training system. The project is sponsored by the Resource Training Organization (RTO), with funding support provided through the Canada-BC Labour Market Development Agreement.

1.1 Research Requirement

In January 2012, the Table contracted R.A. Malatest & Associates to conduct a labour market study of BC's Shipbuilding & Repair industry. This research included a survey of private and public employers and union representatives directly involved in BC's shipbuilding and repair industry, and a secondary survey of employers that supply contracted services (including design and fabrication), as well as materials and equipment to the industry. The purpose of this research is to determine the current and projected industry workforce through 2020, as well as to identify skills and training gaps by occupation that may impact future workforce development. Specific requirements included:

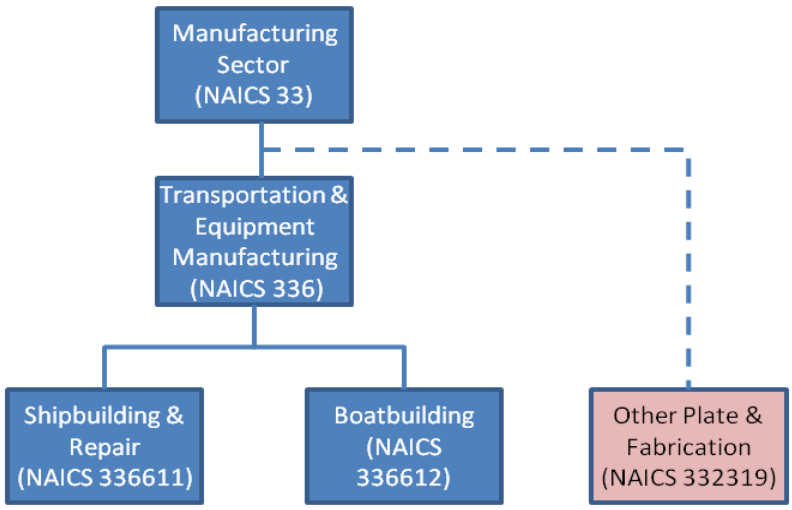
1. Prepare an industry overview and labour force profile of the provincial Shipbuilding & Repair industry;
2. Develop an employment baseline by occupation (2012) for both primary and secondary employers;
3. Develop an occupational demand forecast for:
    a. Primary shipbuilding and repair employers (2012-2016 / 2016-2020)
    b. Secondary industry employers (2020)
4. Develop and validate anticipated new build, refit and maintenance project investment (i.e., public and commercial investments) through 2020;
5. Prepare an inventory of provincial education and training programs in support of the BC industry, identifying gaps, program outcomes and capacity assessment to meet future requirements;
6. Conduct supply side analysis (i.e., sources of labour) based on consultation with post secondary representatives, Aboriginal employment groups, immigration program agencies and unions;
7. Conduct labour demand-supply gap analysis by select occupation through 2020;
8. Analyse impacts on BC's Shipbuilding & Repair industry of major project investments in neighbouring jurisdictions;
9. Prepare final report and recommendations.

The outcomes of this research will provide the foundation for developing by the *Table* a coordinated workforce strategy that will, in turn, help inform private and public investments in labour market programs needed to support the sector.

1.2 Project Scope

The shipbuilding and repair industry comprises establishments primarily engaged in operating a shipyard. Shipyards are fixed facilities with drydocks and fabrication equipment capable of building and/or repairing a ship, defined as a water vessel intended for purposes other than personal or recreational use. The activities of shipyards include the construction of ships, repair, conversion and alteration, the production of prefabricated ship sections and barge sections, and specialized services when performed at the shipyard.

Canada's shipbuilding and repair industry falls within the broader classification of Transportation & Equipment manufacturing within the North American Industry Classification System (NAICS). In relative terms, the industry is small both in terms of the number of establishments and workers employed. Statistical compilation is typically combined with the Boatbuilding industry, which encompasses those establishments primarily engaged in the manufacturing of boats for personal or recreational use.



For the purposes of this research, the study encompasses BC's shipbuilding and repair "cluster", including businesses directly involved in shipbuilding and repair, as well as supporting manufacturing establishments that do *not* operate out of a shipyard (i.e., Other Plate & Fabrication). The study further encompasses related supply chain operators, including engineering and design firms, and material and equipment suppliers, as applicable.

1.3 Research Methodology & Report Structure

This research project builds, in part, on previous research and analysis of BC's Shipbuilding & Repair industry undertaken by the Resource Training Organization in spring 2008 and fall 2010. The current project is conducted in six phases that reflect the project's requirements.

Phase 1 – Industry Overview & Labour Force Profile

Phase 1 involved developing a high level overview of BC's Shipbuilding & Repair industry, highlighting manufacturing revenues from commercial shipyards between 2004 and 2010, and employment and unemployment trends from 2006 through 2011. Data for this overview was provided through secondary statistical sources (Statistics Canada), including the Annual Survey of Manufacturers & Loggers (2010) and the Labour Force Survey (2011) encompassing both the shipbuilding and boat building sectors. Labour Force Survey data informed the calculation of the 2012 employment baseline for the Shipbuilding & Repair industry, per Phase 2.

Phase 2 – Employment Baseline (2012)

Phase 2 involved developing an employment baseline (2012) for BC's Shipbuilding & Repair workforce. Employment data by occupation was collected through primary survey research involving public and commercial employers, as well as labour organizations within the industry cluster. This baseline underpins the development of the employment demand forecast by occupation through 2016 and 2020.

The project also included a survey of "secondary employers" who supply services, materials and equipment to BC's Shipbuilding & Repair industry. The purpose of this survey was to establish an employment baseline for the broader industry cluster, and to determine employment impacts for the industry supply chain based on future shipbuilding and repair investments[2].

Phase 3 – Occupational Demand Forecast (2012-2020)

Phase 3 involved developing an occupational demand forecast based on projections as provided by public and commercial shipyard operators. Future requirements are based on anticipated occupational growth and attrition for 2016 and 2020, and include management, professional/technical, critical function, and skilled trades (i.e., "traditional" and "marine" trades) occupations. For this report, "traditional" trades are those commonly associated with the building trades (e.g., pipefitters, machinists, electricians) and supported by a formal apprenticeship program, whereas "marine" trades are those unique to the marine sector without the benefit of a specific training program (e.g., shipwrights, marine fitters). Occupational forecast data are examined against occupational supply data for the Lower Mainland and Vancouver Island/Coast as maintained by the BC Ministry of Jobs, Tourism & Innovation.

Phase 4 – Industry Investment Outlook

Phase 4 involved identifying and describing all public and commercial shipbuilding, refit, maintenance and repair activities currently underway and planned through 2020. The outlook sets the context in which future labour market development will occur and informs the development of the industry's long-term human resource strategy. Central to this task is the inclusion of all planned public investments in new builds, maintenance, repair and refits, as well as estimated revenues for

[2] As data results of the secondary survey were insufficient to develop an employment baseline for industry suppliers, statistical employment data were used to produce an employment estimate and occupational forecast for the Other Plate & Fabrication sector in the Lower Mainland and Vancouver Island/Coast.

commercial shipyards through 2020. Data was provided by public and private industry sources and validated by stakeholders, including representatives of FMF Cape Breton, Canadian Coast Guard, BC Ferries , Seaspan Marine Corporation and other commercial shipyard operators.

Phase 5 – Supply Side Analysis (Sources of Labour)

Phase 5 involved preparing a supply-side analysis identifying and quantifying sources of potential labour to the industry over the next decade. Industry employers rely on various mechanisms to attract and develop the workforce, including formal industry training and post secondary education programming, recruitment from other businesses and industries, as well as hiring talent from other provincial, national, and international jurisdictions.

The analysis includes the development of an inventory of training and education programs that support the industry, identification of training gaps, and an assessment of the system's capacity to help meet future requirements in high demand (select) occupations. Information has been provided by the Ministry of Advanced Education, the Industry Training Authority and BC Stats, as it relates to program participation and outcomes. In addition, the analysis explores the potential for helping meet future requirements through increased participation from the Aboriginal labour force and other underrepresented groups.

Phase 6 – Demand-Supply Gap Analysis

Phase 6 involved the development of a gap analysis that quantifies the difference between projected labour demand as identified by employers and existing sources of supply to BC's Shipbuilding & Repair industry for the period 2016 and 2020. Occupational supply projections were developed using two methods: 1) projections based on the BC Labour Market Scenario Model (Ministry of Jobs, Tourism & Innovation) and 2) projections based on all sources of potential labour to the industry as identified in Phase 5. As part of the analysis, risks associated with the projections were examined, including workforce implications associated with planned major projects in British Columbia and Alberta that could result in increased competition for similarly skilled workers in BC's Shipbuilding & Repair industry.

SECTION 2: INDUSTRY OVERVIEW & LABOUR FORCE PROFILE

British Columbia's Shipbuilding & Repair industry is dominated by one large company (Seaspan Marine Corporation) with three shipbuilding and repair facilities, one large public employer (Navy shipyard – FMF Cape Breton) and a number of smaller shipyard facilities throughout the Lower Mainland and Vancouver Island/Coast. Capacity for new ship construction is primarily the domain of larger shipyards that also rely on specialized outsourcing for the construction of new vessels. Economic activity is highly cyclical, with most employers maintaining a core group of technical production workers, with additional resources hired as contract requirements demand. The recent federal decision to construct non-combat vessels in BC under the National Shipbuilding Procurement Strategy will help stabilize the "boom and bust" nature of the industry and help promote the development of a sustainable industry workforce for the long term.

2.1 Industry Overview

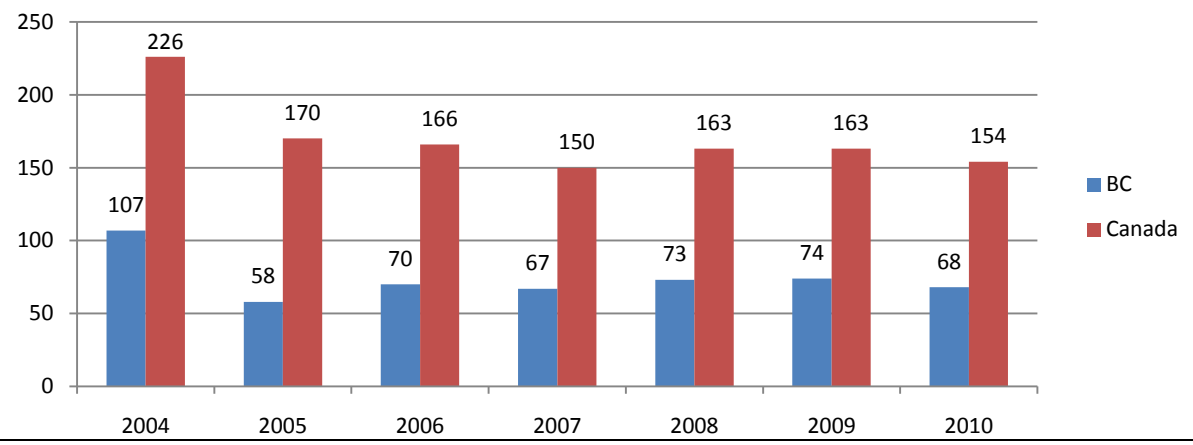
The following examines BC's Shipbuilding & Repair industry using data provided by Statistics Canada. With the exception of Labour Force Survey (LFS) data, industry information is based on the latest available data (2010) as provided by the Annual Survey of Manufacturers & Loggers (ASML). The ASML collects revenue, production and employment data for industries and is the only source of information that provides industry data specific to the Shipbuilding & Repair industry (NAICS 336611) at both the federal and provincial level. Other data sources, including the LFS and Census only provide data at the broader shipbuilding and boatbuilding level (i.e., 4-digit NAICS). The following analysis does not include public shipyards in BC which are aggregated under a different industry classification.

2.1.1 Number of Establishments

After experiencing a decline in 2005, the number of shipbuilding and repair establishments in both BC and Canada has remained relatively stable since the mid-2000s. On average, BC accounted for 43% of all Canadian shipbuilding and repair establishments between 2004 and 2010 – the largest concentration among Canadian provinces. Of the 74 BC establishments identified in 2009, 45 (61%) indicated that they employed at least one employee, including 12 with 1-4 employees, 30 with 5-99 employees, and 3 with 100-499 employees[3]. The largest employer in the industry operates three shipyard facilities in BC (including Vancouver Shipyards, Vancouver Drydock and Victoria Shipyards), and accounts for the large majority of industry activity and employment among commercial operators.

[3] Statistics Canada, Business Patterns Database, December 2010.

Figure 1: Number of Shipbuilding & Repair Establishments
BC & Canada (2004-2010)

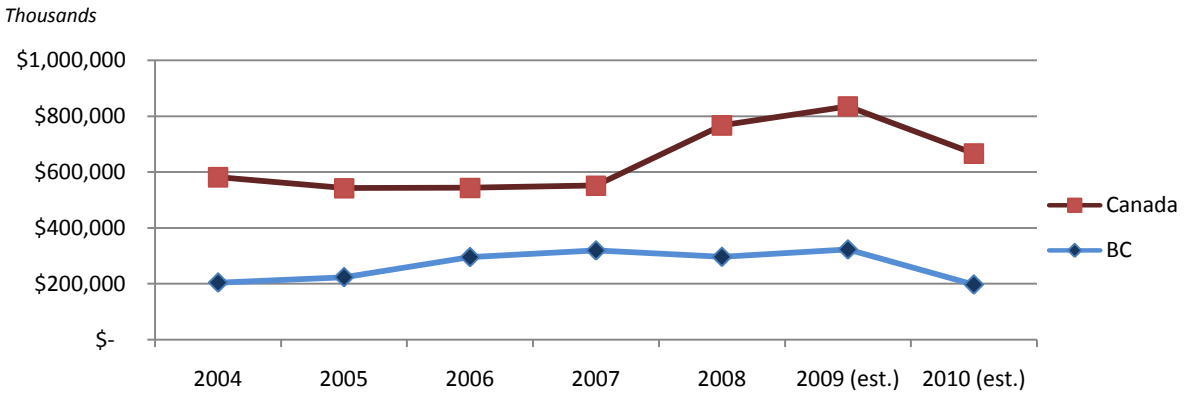


Annual Survey of Manufacturers & Loggers

2.1.2 Manufacturing Revenues

Canada's commercial shipbuilding and repair industry experienced a significant increase in economic activity in 2008 propelled, in part, by the federal government's five-year program to modernize the Canadian Forces' 12 Halifax-Class frigates at a total cost of $900 million[4], including $351 million in BC. Industry revenues slumped in 2010, as the fall-out from the 2008 economic downturn resulted in fewer commercial and government contracts. The large majority of revenue is generated through maintenance, repair and refit activity, including significant expenditures allocated in support of federal and provincial fleets. On average, the commercial BC industry generated revenues of $265 million each year between 2004 and 2010, with smaller operators (i.e., excluding Seaspan operations) accounting for about 25% of annual activity[5].

Figure 2: Shipbuilding & Repair Manufacturing Revenues – BC & Canada
2004-2010



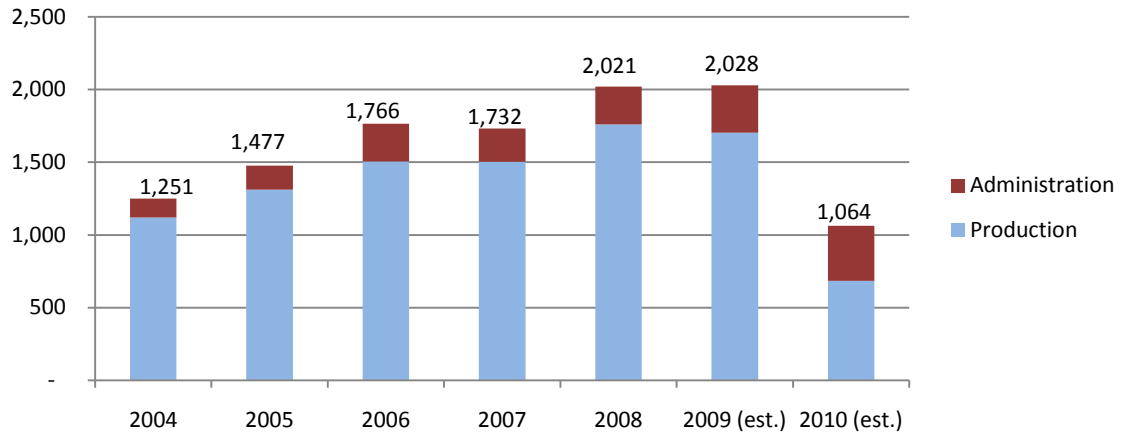
Annual Survey of Manufacturers & Loggers

[4] This figure does not include the in-service component of the modernization project (i.e., CSI) estimated a $2 billion.
[5] Industry estimate.

2.1.3 Employment – Production & Administration

Production employees include those working directly in manufacturing operations, whereas administrative workers are those designated as executive, administrative, office and sales staff. On average, production workers accounted for 84% of total employment between 2006 and 2010 within BC's commercial Shipbuilding & Repair industry. Total employment followed a positive upward trend through the second half of the decade, peaking at 2,028 workers in 2009. Employment fell dramatically in 2010 (by almost 50 percent), with the impact largely being felt among the production workforce where employment fell to less than 700 workers.

Figure 3: Employment – British Columbia
2004-2010



Annual Survey of Manufacturers & Loggers

2.1.4 Revenue / Worker – Actual & Projected

Revenue/employment ratios can be used to help forecast notional workforce requirements based on projected revenue growth for the industry. On average, employers in BC's Shipbuilding & Repair industry generated $162,436 in revenue for every employed worker (production and administrative) between 2004 and 2010. For illustrative purposes, an increase in manufacturing revenues to $500 million could result in an estimated workforce of more than 3,000 workers, and more than 4,600 workers with revenues of $750 million. Given projected planned investments over the next decade, the BC industry could expect employment increases on a similar scale for work associated with refits, maintenance and repair activities. Construction of new builds is less labour intensive requiring an estimated one worker for every $242,442 in revenue (i.e., about two-thirds of the required workforce for refit, maintenance and repair activity[6]).

[6] Industry estimate

Table 1: Revenue / Worker (2004-2010) & Projected Workforce Requirements

BC	2004	2005	2006	2007	2008	2009 (est.)	2010 (est.)	Average (2004-10)	Projected	
Annual Revenue ($)	$204.3M	$223.7M	$295.3M	$319.0M	$296.1M	$322.5M	$197.2M	$265.4M	$500.0M	$750.0
Employment (# of Workers)	1,351	1,477	1,766	1,732	2,021	2,028	1,064	1,634	3,078	4,617
Revenue / Worker	$151,221	$151,456	$167,214	$184,180	$146,512	$159,024	$185,338	$162,436	$162,436	$162,436

Annual Survey of Manufacturers & Loggers

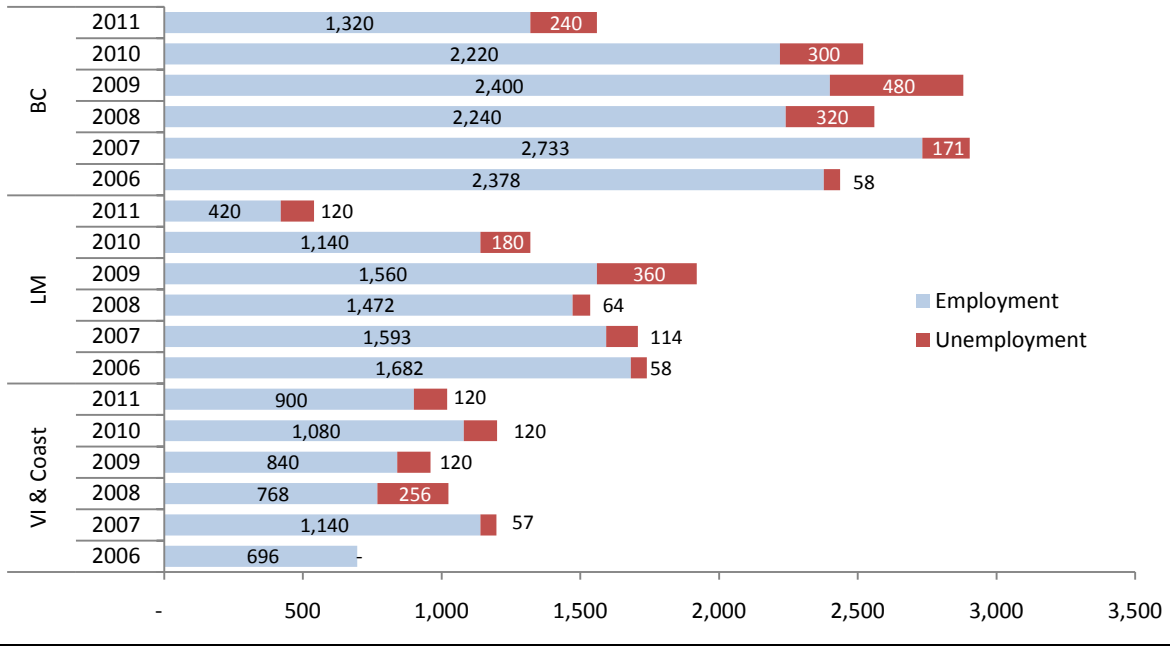
2.2 Labour Force Profile

Labour Force Survey (LFS) data is used to examine employment and unemployment trends in the industry at the regional level. LFS data are aggregated at the 4-digit industry classification level (i.e., shipbuilding and boat building), with an estimated annual share of 57% attributed to shipbuilding (on average). Overall employment estimates are generally higher than ASML estimates, due to the different survey methodologies and the varying impact of employment in the boat building industry. This is particularly the case in 2007, when boat building experienced a substantial increase in employment relative to shipbuilding and repair.

2.2.1 Employment & Unemployment (2006-2011)

Labour Force Survey data is reported for the Lower Mainland, Vancouver Island/Coast and all BC. As shown in Figure 4, employment followed an uneven trend in the latter half of the decade, highlighted by a particularly sharp decline in the Lower Mainland in 2011. Employment averaged 2,003 workers over this period, with unemployment averaging close to 12 percent. The 2011 decline in employment corresponded with a shrinking labour force, suggesting a large segment of the workforce was successful finding employment in other industries.

Figure 4: Employment & Unemployment – Vancouver Island/Coast, Lower Mainland & BC 2006-2011



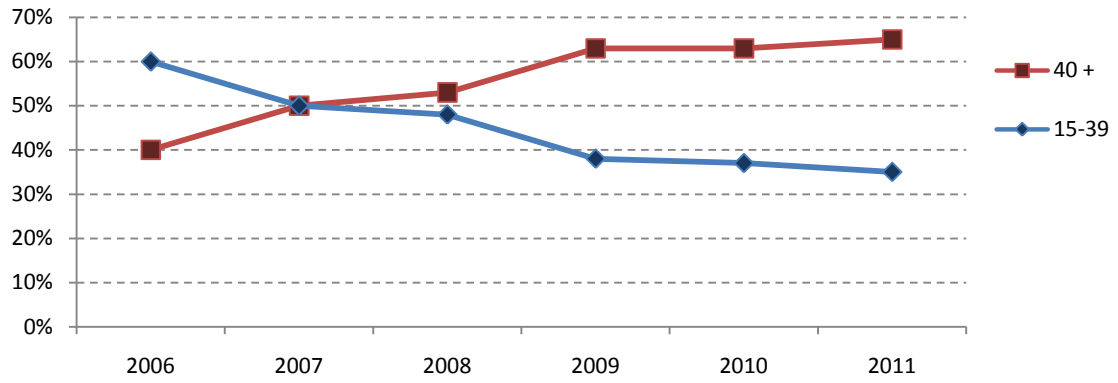
Labour Force Survey

2.2.2 Age Demographic – Shipbuilding & Boat Building

The shipbuilding and repair industry workforce is aging and fewer younger workers are available to replace those leaving or about to retire. This is an overriding concern for industry, particularly as it prepares to expand and replace its workforce to meet projected demand. In examining the age breakdown of the combined shipbuilding and boat building labour force, 65% of workers were over 40 years of age in 2011, compared to 40% in 2006 (Figure 5). By comparison, the average age of trades workers in BC was 40.5 years in 2010[7]. A shift of this magnitude over a relatively short time period reinforces the notion that mostly younger workers are laid off during slower periods of economic activity and fewer return when business activity improves. This trend is also understated for BC's shipbuilding and repair workforce, which is reported to be older based on employer survey results (Section 4.4.1).

[7] BC Trade Occupations Outlook 2010-2017

Figure 5: Age – Shipbuilding & Boat Building
2006-2011 (Labour Force Survey)

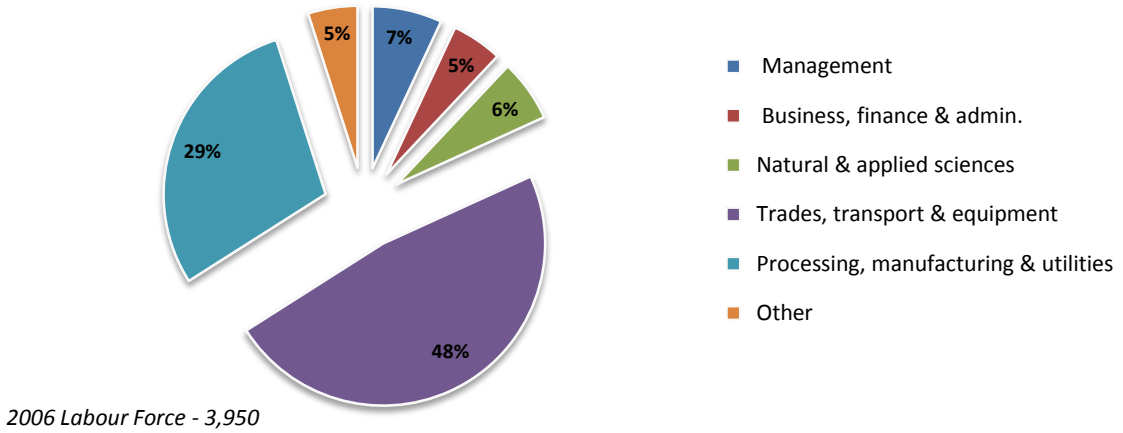


Labour Force Survey

2.2.3 Occupational Composition – Shipbuilding & Boatbuilding

Based on Census data, more than three-quarters (77%) of the combined shipbuilding and boat building workforce is comprised of semi-skilled workers employed in processing and manufacturing jobs, and skilled workers employed in the trades, including pipefitters, machinists, mechanics and electricians. While the two workforces share some similarities, the production workforce in shipbuilding is far more dependent on skilled trade workers, particularly those associated with the metal trades. The difference in project scale further differentiates the two workforces, as shipbuilding projects generally require more engineering, operational and project management to complete the work. As such, there is generally a low level of worker mobility between the two marine based sectors.

Figure 6: Occupational Composition – Shipbuilding & Boat Building
2006



2006 Labour Force - 3,950

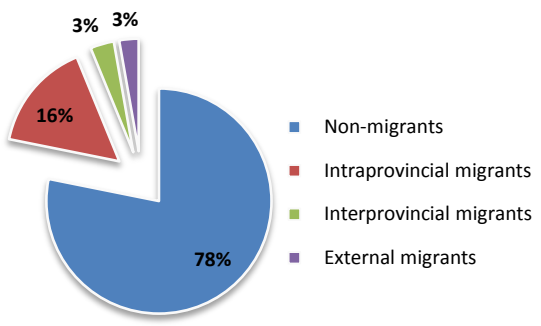
Census

2.2.4 Mobility Status – Shipbuilding & Boat Building

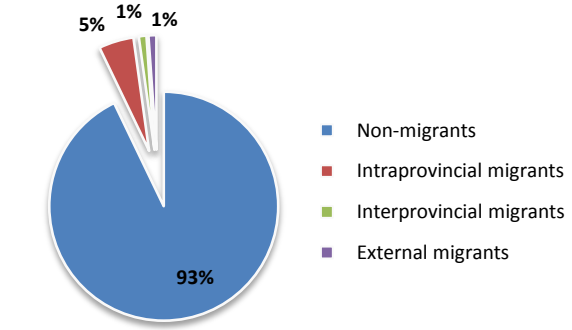
Having an understanding of the mobility status of the existing workforce is important in developing strategies to attract and recruit future workers from various jurisdictions. Nearly four-in-five workers (78%) in shipbuilding and boat building are non-migrants, suggesting the industry relies heavily on the local workforce. Between 2001 and 2006, just six percent of workers migrated to the industry from outside of British Columbia (including 3% from outside of Canada), whereas established migrants (pre-1996) represented, on average, about 20% of the skilled industry workforce[8].

Compared to BC's overall manufacturing sector, the shipbuilding and boat building workforce is relatively diverse, as just 7% of BC's manufacturing workforce migrated to the industry from outside of the province between 2001 and 2006. Given the shrinking pool of younger skilled workers, attracting a larger number of provincial, national and international migrants to the industry will be an important consideration in future recruitment activities.

Figure 7: Worker Mobility (2001-2006)
Shipbuilding & Boat Building vs. All BC Manufacturing 2006 (Census)



Shipbuilding & Boat Building Labour Force - 3,950



Manufacturing Labour Force - 189,120

Census

2.3 Summary

BC's Shipbuilding & Repair industry is dominated by one large commercial employer, a similarly-sized public employer and several smaller shipyard operators located in the Lower Mainland and Vancouver Island/Coast. Between 2006 and 2011, the commercial industry workforce averaged 2,003 workers, most of which were employed in a production capacity. Year-to-year economic activity is highly variable, driven largely by short-term contracts to repair and upgrade existing vessels for both private and public owners. New construction is typically the purview of larger shipyards, which possess the infrastructure and skills sets required of new vessels. The introduction of the National Shipbuilding Procurement Strategy will test the industry's ability to acquire and develop the necessary skill sets to construct new vessels on a scale that is much larger and more technologically advanced than any ship previously constructed in BC.

[8] BC Trade Occupation Outlook 2010-2020

SECTION 3: INDUSTRY OUTLOOK – 2020

The following is a summary overview of the major shipbuilding and repair projects planned and underway in BC for the period 2012-2020. Revenue forecast data are from publically available sources, survey response data, as well as financial information provided by industry participants, including FMF Cape Breton (FMF), Canadian Coast Guard (CCG), BC Ferries (BCF), Seaspan Marine Corporation (Seaspan) and other commercial shipyard operators. The information focuses on public investments in new builds, refits, maintenance and repair, as well as in-service support activities associated with the Halifax-class frigates (FELEX), Victoria-class submarines (VISSC), and the Minor Warships & Auxiliary Vessels (MWAV). It also includes estimated revenues generated by other commercial shipyard operators in BC for ongoing refit, maintenance and repair activities, based on an annual percentage share of total industry revenue of 25%[9]. The information is intended to provide a comprehensive understanding of projected investments and timing of each activity through 2020, as well as the notional employment requirements associated with each project. Notional employment estimates are based on the estimated ratio of employment to revenue between 2004 and 2010 (Section 2.1.4).

3.1 New Build Program

The construction of non-combat vessels for the Canadian Coast Guard and Navy under the National Shipbuilding Procurement Strategy represents the largest planned investment in BC's shipbuilding and repair industry. The original plan announced in October, 2011 called for the construction of one oceanographic vessel ($145 million), three offshore fisheries vessels ($244 million), one polar icebreaker ($800 million), and two supply ships for the Department of National Defence ($2.6 billion) at an estimated total investment of $3.8 billion. The work will be carried out at Seaspan facilities, distributed between Vancouver Shipyards, Vancouver Drydock and Victoria Shipyards. The tentative build plan would have both Navy supply ships constructed and outfitted at Seaspan's Vancouver facilities. Structural work on CCG vessels would also be completed at Vancouver, while outfitting and substantial completion would be undertaken at Victoria. For revenue allocation purposes, two-thirds of the new build program has been assigned to Seaspan's Vancouver facilities, and one-third to Victoria Shipyards.

The more recent announcement in the March federal budget committed $5.2 billion to the construction of CCG vessels (and helicopters). This announcement completes the NSPS program for non-combat vessels and includes several replacements in addition to those announced in the original October 2011 plan. Although not specified in the federal budget, information provided on the CCG website suggests the construction of 20 additional vessels, including nine mid-shore patrol ships, two specialty vessels, five search and rescue, three near-shore fishery and one air cushion vehicle (hovercraft). These new builds have been identified by CCG for replacement in previous capital plans. While the federal program announcement is valued at $5.2 billion, this would include the capital cost of CCG vessels identified in the original plan valued at $1.2 billion. Factoring in the replacement cost of CCG helicopters (estimated $200 million), the total additional new build

[9] Average annual estimate as provided by industry

investment is estimated at $3.8 billion. Although not part of the NSPS program, approximately 70 government vessels less than 1000 tonnes have been identified for renewal and will be constructed by smaller Canadian shipyards. Seaspan and Irving are not eligible to bid on these future projects.

BC Ferries is one of the largest ferry operators in the world, and maintains a sailing fleet of 35 vessels. In 2011, BC Ferries announced its new build program that would see the replacement of 26 vessels over the next 15 years (2027) and a total capital investment (new build) of $1.1 billion through 2022. Four new vessels are scheduled for replacement over the next five years (2012-16), and another five by 2022. Contracts have not been tendered for the construction of any replacement vessels at this time. Given the focus on the federal NSPS in the near term, this analysis assumes $0 investment will be made in the BC industry for the replacement of BC Ferry vessels between 2012 and 2016 (estimated at $287 million), and that planned investments between 2017 and 2020 will be fully invested in the BC industry (estimated at $448 million). The analysis further assumes that future BC Ferry investments in replacement vessels beyond 2020 will be made in the BC industry.

Other new build projects currently underway in the BC industry include the construction of one oil barge and three chip barges undertaken by Seaspan (Vancouver Shipyards). The estimated total cost of this project is $10 million with project completion scheduled for late 2012.

Table 2 details annual investment estimates associated with the construction of all current and proposed new build projects in the BC industry through 2020. Total new build investment through 2020 is estimated at $6.75 billion. For illustrative purposes, notional workforce requirements have been developed based on revenue/worker ratios as identified in Section 2.1.4. Employment related to the construction of new vessels is projected to increase rapidly beginning in 2013 and peak in 2019 when the majority of the proposed new builds are completed or near completion.

Table 2: New Build Investment Estimate ($millions) & Notional Workforce Requirements

Service	*Project*	*Client*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*	*Total*
New Build	NSPS Ferry Barge	DND/CCG BCF Seaspan	$5.0	$5.0	$387.9	$770.3	$746.1	$953.6	$1,116.0	$1,158.0	$1,137.0	$470.6	**$6,749.5**
Workforce Requirement (1 worker: $242,442)			21	21	1,600	3,177	3,077	3,933	4,603	4,776	4,690	1,941	**3,475 (2013-20)**

3.2 Refit Program

The Halifax-Class Modernization/Frigate Life Extension (FELEX) project involves the modernization of the Canadian Forces' 12 frigates at a total cost of $3.1 billion. The FELEX project involves three phases: mid-life refit at a cost of $900 million; modernization of the ships combat systems (Combat Systems Integration) at a cost of $1.4 billion; and $600 million in ongoing maintenance through 2030. The CSI phase of the project is lead by Lockheed Martin, with in-service support provided by Victoria Shipyards. The initial Platform System Design contract valued at $150 million was awarded to Fleetway.

In March 2008, Seaspan (Victoria Shipyards) was awarded the contract for the mid-life refit of five of the 12 frigates and one Navy supply ship (Algonquin) valued at $351 million. Program implementation began in 2009 with Victoria Shipyards having completed four of the six refits through 2011. The last two refits are scheduled for completion in 2013, followed by ongoing maintenance and repair through 2030. This analysis estimates an average cost of $50 million for each refit with regular maintenance estimated at $3 million annually over 17 years (2014-2030).

BC Ferries has identified a number of planned refits to its existing fleet, including a $100 million upgrade to the fleet's two Spirit class vessels by 2016, as well as a number of planned refits to smaller vessels through 2020. In total, BC Ferries plans to invest $403 million between 2011 and 2020 for refitting various vessels within the existing fleet.

Refits to other Canadian Forces' vessels (RCN), including six maritime coastal vessels and one supply ship, are also scheduled to occur over the next 10 years. The total value of these refits is conservatively estimated at $40 million over the next 10 years, an annual estimated cost of $4 million. Refit work on these vessels will be carried out by FMF dockyard staff.

Table 3 details annual investment estimates associated with the industry's public refit program through 2020. Total value of the refit program is estimated at $593.0 million, with refit activity tapering off in 2014 and remaining steady for the remainder of the decade. For illustrative purposes, notional workforce requirements have been projected based on the revenue/worker ratio identified in Section 2.1.4. Proposed refit work would employ, on average, 365 workers between 2011 and 2020.

Table 3: Refit Program Investment ($millions) & Notional Workforce Requirements

Service	*Project*	*Client*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*	*Total*
Refit	All	RCN FMF BCF	$79.0	$95.0	$104.0	$39.0	$46.0	$43.0	$49.0	$46.0	$46.0	$46.0	**$593.0**
Workforce Requirement (1 worker: $162,436)			486	585	640	240	283	265	302	283	283	283	**365 (2011-20)**

3.3 Maintenance & Repair Program

Since the mid-1990s, maintenance and repair (and refit) work has been the primary driver of economic activity within the BC industry, with new build construction experiencing sporadic activity since the mid-1990s. Over the next 10 years, the industry's maintenance and repair (M&R) program will account for the second largest source of revenue for BC shipyards. M&R activities are ongoing with work conducted at both private and public shipyard operations in the Lower Mainland and Vancouver Island/Coast.

Commercial shipyards generated average manufacturing revenues of $265 million each year between 2004 and 2010[10], with Seaspan operations (Victoria Shipyards, Vancouver Shipyards, Vancouver Drydock) accounting for the majority of all manufacturing activity (Section 2.1.2). During this period, smaller shipyard operators accounted for an estimated 25% of industry revenues each year, as indicated by industry stakeholders. Similar estimates are used to project manufacturing revenues from M&R activities for smaller commercial operators through 2020. Revenue estimates for M&R activities undertaken at Seaspan facilities are determined based on the company's total projected revenues less other revenues from new builds, refits and in-service contracts.

M&R activities are also undertaken by public shipyards, including FMF Cape Breton, BC Ferries (Deas Pacific Marine) and Canadian Coast Guard. On average, roughly 70% of fleet maintenance activity as managed by CCG and BC Ferries is contracted out to commercial shipyards, while the majority of M&R activity associated with the Canadian naval fleet (Maritime Forces Pacific) is undertaken by dockyard staff at FMF Cape Breton.

Table 4 details annual revenue estimates associated with the industry's M&R program through 2020. Total revenues over this period are estimated at more than $2.0 billion, averaging just under $200 million each year. For illustrative purposes, notional workforce requirements have been projected based on the revenue/worker ratio identified in Section 2.1.4. Employment requirements associated with M&R activities are expected to decline through 2016, as the industry shifts its focus towards the new build program in the mid-part of the decade. M&R activity is expected to follow an upward trend beyond 2020, as vessels constructed in the previous decade begin to age.

Table 4: M&R Program Investment ($millions) & Notional Workforce Requirements

Service	Project	Client	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
M&R	All	All	$306.9	$319.1	$231.7	$212.5	$211.2	$154.1	$150.9	$153.6	$153.6	$153.6	**$2,046.9**
Workforce Requirement (1 worker: $162,436)			1,889	1,964	1,426	1,308	1,300	948	929	945	945	945	**1,260 (2011-20)**

3.4 In-Service Program

In-service support contracts are those which are managed by third party contractors with the assistance of dockyard staff in public and/or private facilities. Currently, there are three major in-service support contracts in place as awarded by the Department of National Defence and the Canadian Forces.

Signed in 2008, the Victoria In-Service Support Contract (VISSC) was awarded to Babcock Canada (originally CSMG) to provide in-service support for the Victoria-class submarines (4). The VISSC is valued up to $1.5 billion over a period of up to 15 years (2023). DND is currently in the first five-year option of the contract (2013), with two additional five-year options through 2023. Dockyard support is provided by FMF Cape Breton and Seaspan (Victoria Shipyards) during Extended Docking Work

[10] Annual Survey of Manufacturers & Loggers

Periods (EDWP) at an estimated cost of $30 million annually. This analysis assumes that two-thirds of the in-service support is provided by Victoria Shipyards ($20 million annually) and one-third by FMF Cape Breton ($10 million annually) throughout the contract period (2023).

As part of the 2008 Halifax-class modernization project, the Combat Systems Integration (CSI) phase involves upgrading command and control systems, redesigning the operations room and installing a new radar suite for Canada's 12 frigates. The CSI contract, awarded to Lockheed Martin, is valued at approximately $2 billion and includes a $600 million in-service support component for all 12 frigates. In-service support for the five MARPAC based vessels is provided by Seaspan (Victoria Shipyards) at a total estimated cost of $250 million through 2030.

SNC Lavalin has been providing in-service naval vessel support to the Department of National Defence since 1994. In 2011, SNC Lavalin signed an agreement to provide national and international in-service support under the Minor Warships and Auxiliary Vessel (MWAV) contract, encompassing Orca-class patrol and auxiliary vessels (44 total vessels). Although details of the current contract are not available, the previous contract was four years in length plus an option for an additional four years, and a total cost of $240 million over eight years. While project management is the responsibility of SNC Lavalin, in-service support for these vessels has been provided by various BC shipyards. The current analysis assumes a similar four-year contract at a cost of $200 million, with an option for another four years, and an in-service cost estimate of 20% (or $40 million) through 2018.

On a smaller scale, the Canadian Coast Guard also indicated their use of in-service contract arrangements with suppliers, averaging around $2 million per year through 2020.

Table 5 details financial estimates associated with the industry's in-service program through 2020. Total investments over this period are estimated at more than $503 million. For illustrative purposes, notional workforce requirements have been projected based on the revenue/worker ratio identified in Section 2.1.4. On average, in-service support contracts will generate employment for 310 workers annually.

Table 5: In-Service Program Investment ($millions) & Notional Workforce Requirements

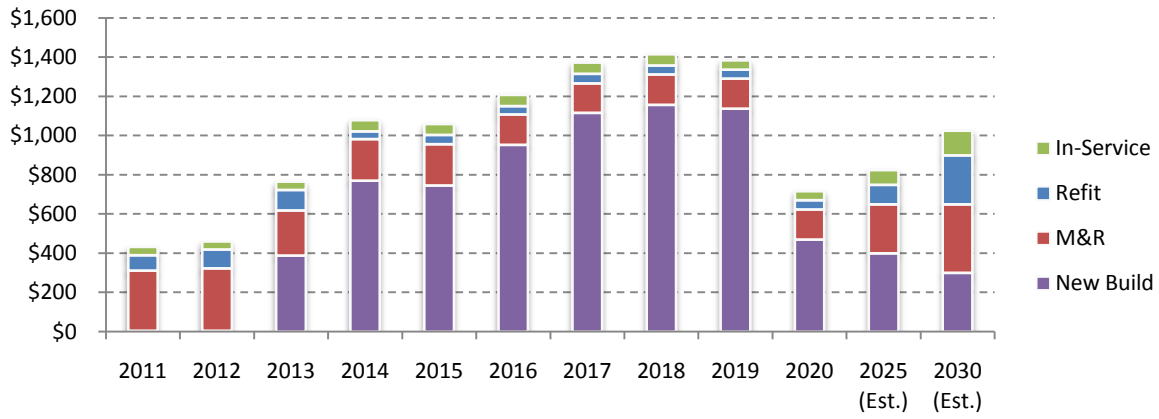
Service	Project	Client	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
In-Service Support	VISSC FELEX-CSI MWAV Fleet	DND/RCN DND/RCN DND/RCN CCG	$42.5	$42.0	$42.0	$56.7	$56.7	$56.7	$56.7	$56.7	$46.7	$46.7	**$503.4**
Workforce Requirement (1 worker: $162,436)			262	259	259	349	349	349	349	349	287	287	**310 (2011-20)**

3.5 Summary

BC's shipbuilding and repair industry is poised to see total program investment more than triple by the middle part of the decade. Total planned investment over this period is estimated at more than $9.9 billion, with the majority (68%) dedicated to the new build program under the NSPS, and more than 20% allocated to maintenance and repair activities. Based on the NSPS and related activities,

BC's Shipbuilding & Repair industry could transform into a billion per year entity for public and commercial shipyards in BC. Beyond the 2020 horizon, the cycle of operations will likely see a decline in new build construction and an increase in maintenance, repair and refit activity through to 2030 (Figure 8).

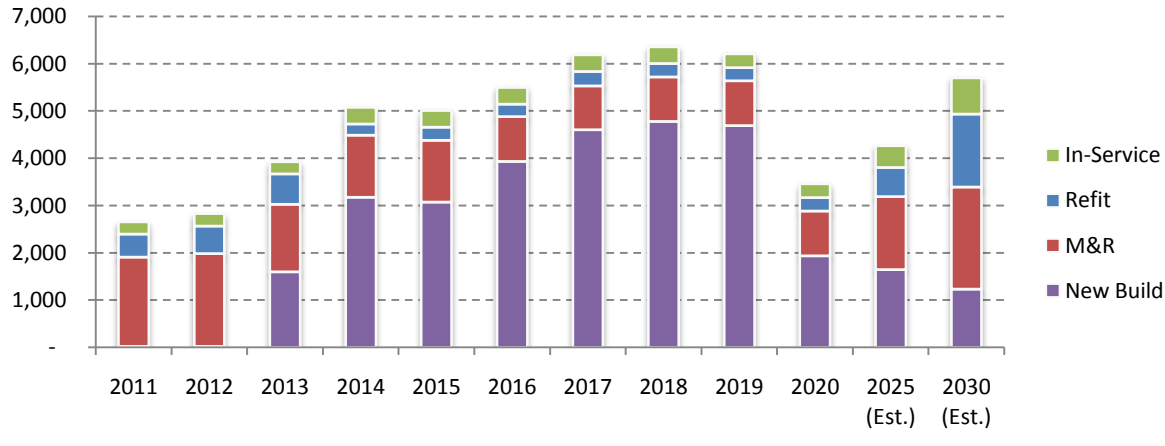
Figure 8: Investment Overview in BC's Shipbuilding & Repair Industry (2011-2030 Est.)



For a detailed breakdown of program investments by organization, see Appendix B

Notional employment is projected to peak in the latter half of the decade when the new build program is expected to be most active. Beyond 2020, employment is projected to decline in the early part of the decade until such time that maintenance, repair and refit activity will increase as vessels upgraded and constructed in the previous decade begin to age. The launch of the NSPS, the prospect of constructing replacement vessels for BC Ferries, and ongoing maintenance, repair and refit activity, has the potential to create long term stability in an industry historically characterized by economic uncertainty and ad hoc workforce development.

Figure 9: Notional Employment - Shipbuilding & Repair Industry 2011-2030 (Est.)



SECTION 4: EMPLOYMENT BASELINE & OCCUPATIONAL FORECAST

A primary objective of this study was to develop an employment baseline (2012) and occupational forecast through 2020 for BC's Shipbuilding & Repair "cluster", based on input from primary shipbuilding and repair employers and secondary employers that supply services and equipment to the industry. In February/March 2012, the consultant conducted a survey of public and commercial employers, as well as labour organizations that supply workers to the industry. The survey instrument was developed by the consultant with input and guidance from the Table. The survey yielded 20 responses from a sample of approximately 40 employers and unions, including 10 private employers, three public employers and seven unions. Employers who responded to the survey accounted for more than 85% of the industry workforce.

A related survey of suppliers (i.e., secondary employers) to the BC Shipbuilding & Repair industry was also conducted in March/April 2012. This research involved the identification of key suppliers of services, materials and equipment to the industry, as identified by public and commercial shipyard operators. Many of the key suppliers contacted for the survey have occupational requirements similar to shipbuilding and repair industry, including metal fabricators (i.e., Other Plate & Fabrication) that do *not* operate out of a shipyard. Local suppliers of metal fabrication services will be particularly impacted by the expansion of the shipbuilding and repair industry as a result of planned investments in new vessel construction.

A key consideration in developing the sample of secondary employers was to include only those suppliers whose primary business was in supplying the marine industry. This proved problematic as few suppliers met this criterion since their business often spanned multiple industries. In addition, the sample included suppliers from a range of related industries, therefore compromising efforts to develop a representative sample. As a result, the survey of secondary employers yielded a low response (n=9) with insufficient data for baseline development or occupational projection purposes. To mitigate this deficiency, the consultant relied on secondary statistical sources and the BC Input-Output model to develop a baseline employment estimate and occupational projections for the Other Plate & Fabrication subsector.

4.1 Baseline Estimate & Occupational Projections – Analytical Framework

Development of the baseline estimate for BC's Shipbuilding & Repair cluster involved a combination of primary research data and secondary statistical data as provided by Statistics Canada. The survey of primary shipbuilding and repair employers provided quantitative data to support the development of an employment baseline for 2012 and occupational forecasts for 2016 and 2020. Statistical data from the Annual Survey of Manufacturers & Loggers (ASML), Labour Force Survey (LFS) and Census provided the basis for developing an employment estimate for the Other Plate & Fabrication sector for the Lower Mainland and Vancouver Island/Coast. Occupational forecasts for this sector were calculated using employment multipliers derived from the BC Input-Output model. The graphic below details the methodology adopted for developing the baseline estimate and occupational projections for both the Shipbuilding & Repair industry (NAICS 336611) and the Other Plate & Fabrication sector (NAICS 332319).

Baseline Development & Occupational Projection Framework
Shipbuilding & Repair and Other Plate & Fabrication

4.2 Baseline Employment Estimate (2012)

4.2.1 Shipbuilding & Repair Industry

As of March 2012, the total reported workforce for BC' Shipbuilding & Repair industry was 2,906, based on employment data provided by employers who responded to the survey. This figure includes both production and administrative workers employed full time in public and commercial shipyard operations. However, it does not include those workers whose employers did not respond to the survey. In this case, an adjustment to the reported workforce was required to account for the total shipbuilding and repair industry in British Columbia.

The adjustment to the reported workforce is based on the average number of workers employed in the industry between 2006 and 2011 (Section 2.2.1). Based on Labour Force Survey data, employment in the industry averaged 2,003 workers over this six-year period. This figure, however, includes only those workers employed in commercial shipyard operations in BC, as workers employed at dockyard facilities owned by public agencies are aggregated under a separate industry classification. As such, the adjustment factor only applies to the commercial segment of the industry workforce, resulting in an additional 292 workers. Based on this approach, the total industry workforce in spring 2012 was estimated at 3,198 workers, of which 63% were employed at commercial shipyard operations.

Table 6: Baseline Employment Estimate – Shipbuilding & Repair Industry
Reported & Adjusted (2012)

Employers (respondents)	Reported*	%	Adjusted	%
Public (n=3)	1,195	41%	1,195	37%
Private (n=10)	1,711	59%	2,003	63%
Total Workforce	**2,906**	**100%**	**3,198**	**100%**

** Includes vacancies*

4.2.2 Baseline Employment by Occupation

The occupational structure used to aggregate the number of workers identified in the employer survey is somewhat different from that used under the National Occupational Classification (NOC) system. The NOC organizes over 40,000 job titles into 10 broad occupational categories to manage the collection and reporting of occupational statistics. To understand the relationship between the NOC and the occupational classification used in the survey, the following concordance table (Table 7) is presented, identifying those categories of workers relevant to this study.

BC's shipbuilding and repair workforce also contains occupations that are also unique to the marine environment. For this report, the term "traditional" trade is used to differentiate building trade occupations, such as pipefitters, machinists and mechanics, from "marine" trade occupations, such as shipwrights and marine fitters. Both traditional and marine trades are considered *skilled* trades, yet traditional trades benefit from occupation-specific training programs (i.e., apprenticeship),

whereas marine trades do not. For this analysis, marine trades are organized within the Manufacturing & Utilities occupational category.

Table 7: Concordance Table – NOC & Shipbuilding & Repair Industry (SRI) Occupational Classification

National Occupational Classification (NOC)	SRI Occupational Classification
0. Management	- Non-production (e.g., senior management) - Production (e.g., operations, manufacturing)
1. Business, Finance & Administration	- Critical Function & Support (e.g., project management, purchasing, quality assurance) - Administration & Support
2. Natural & Applied Sciences	- Professional (e.g., professional engineers) - Technologists & Technicians (e.g., mechanical, electrical)
7. Trades, Transport & Equipment	- "Traditional" Trades (e.g., pipefitter, mechanic, electrician, machinist)
9. Manufacturing & Utilities	- "Marine" Trades (e.g., marine fitter, marine engine mechanic, shipwright)
3. Health 4. Education, law & social, community & government 5. Art, culture, recreation & sport 6. Sales & service 8. Natural resources, agriculture & related production	- Other

The number of workers employed in each occupation has been calculated based on the adjusted total workforce (3,198). As detailed in Table 8, the workforce is dominated by workers employed in the traditional (66%) and marine trades (14%). Current vacancies were highest among technologists and technicians (24%), while the industry vacancy rate stood at 3.1% as of spring 2012.

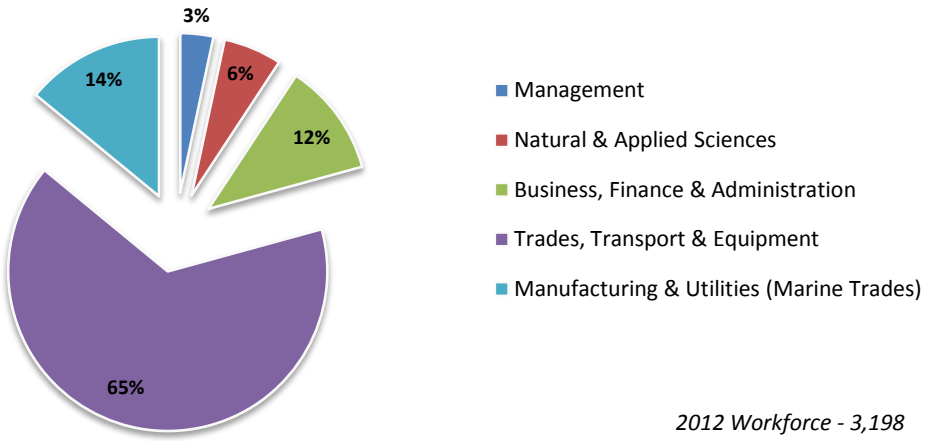
Table 8: Employment Baseline by Occupational Category – Shipbuilding & Repair Industry (2012)

	Reported Employment				Baseline Employment	
Occupational Category	*Current*	*Vacancies*	*%*	*Total*	*#*	*%*
Management (Non-Production)	37	0	0.0%	37	41	1.3%
Management (Production)	59	1	1.7%	60	66	2.1%
Critical Function & Support	173	5	2.9%	178	197	6.2%
Professional Engineers	22	2	9.1%	24	27	0.8%
Technologists & Technicians	119	29	24.4%	148	164	5.1%
Administration & Support	139	17	12.2%	156	173	5.4%
Traditional Trades	1,891	4	0.2%	1,895	2,100	65.7%
Marine Trades	380	28	7.4%	408	452	14.1%
TOTAL	**2,820**	**86**	**3.1%**	**2,906**	**3,198**	**100%**

See Appendix C – Employment Baseline (all occupations)

For purposes of this analysis, all major occupations contained within the shipbuilding and repair workforce (as identified in the employer survey) have been aggregated within the five broad NOC categories relevant to the industry (Figure 10). The industry's occupational structure is similar to that of the Other Plate & Fabrication subsector (Section 4.2.4), highlighting the challenge meeting future requirements for the broader industry cluster.

Figure 10: Occupational Structure – Shipbuilding & Repair
2012



4.2.3 Other Plate & Fabrication Sector

BC' Shipbuilding & Repair industry is supported by myriad suppliers of equipment, materials and services, including suppliers of prefabricated metal ship, boat and barge sections not manufactured at a shipyard. Although a small segment of the broader manufacturing sector, the Other Plate & Fabrication subsector (NAICS 332319) is a major contributor to meeting the ongoing metal fabrication requirements of BC's Shipbuilding & Repair industry. Expectations are such that the subsector will grow and that demand for workers will commensurately increase, as the Shipbuilding & Repair industry expands over the next decade and beyond.

As part of this research study, efforts were taken to survey local employers in this subsector as well as other suppliers (i.e., secondary employers) to determine the size and composition of this workforce and to develop occupational projections through 2020. Due to the low survey response and insufficient data, estimates of the secondary workforce could not be developed. As a proxy, workforce estimates have been developed based on secondary statistics including the Annual Survey of Manufacturers & Loggers, Labour Force Survey and Census.

Similar to the shipbuilding and repair industry workforce, BC's Other Plate & Fabrication workforce is small with employment ranging between 2,794 workers in 2006 and 2,187 workers in 2010. Employment for 2011 and 2012 was estimated based on the recent change in manufacturing employment in BC's durable goods sector, which declined by 4.6% in 2011 and increased by 2.2% in the first quarter of 2012 (January-March). Regional employment estimates for the Lower Mainland and Vancouver Island/Coast were determined based on the percentage share of workers employed

in the larger Architectural & Structural Metals manufacturing sector (NAICS 3323) in each of these two regions. Based on Census data, these two regions comprised 67% of the province's Other Plate & Fabrication subsector in 2006.

Table 9: Baseline Employment Estimate – Other Plate & Fabrication
Lower Mainland & Vancouver Island/Coast – 2006-2012 (Estimate)

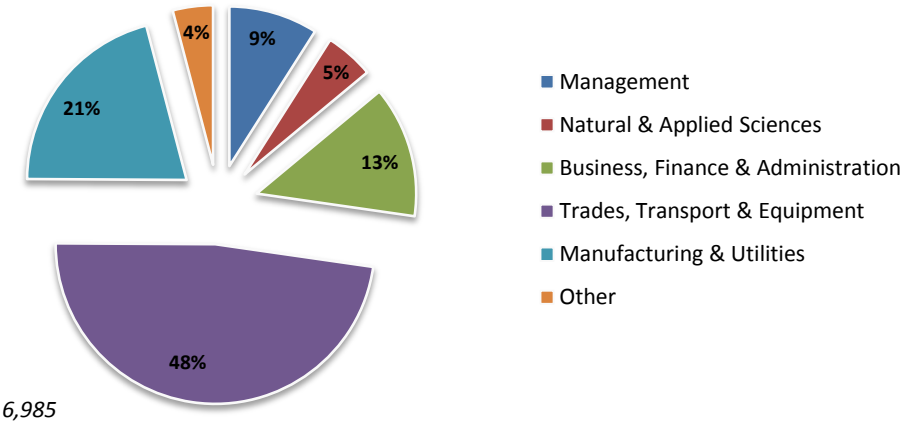
Other Plate & Fabrication	2006	2007	2008	2009	2010	2011 (Est.)~	2012 (Est.)~
British Columbia*	2,794	2,572	2,656	2,304	2,187	2,086	2,132
- Lower Mainland (61%)^	1,704	1,569	1,620	1,405	1,334	1,273	1,301
- Vancouver Island/Coast (6%)^	168	154	159	138	131	125	128
LM + VI/C (67%)	**1,872**	**1,723**	**1,780**	**1,544**	**1,465**	**1,398**	**1,429**

(*) Annual Survey of Manufacturers & Loggers; (^) Census; (~) Labour Force Survey

4.2.4 Baseline Employment by Occupation

On average, production workers comprise close to 80% of the Other Plate & Fabrication workforce, many of whom possess skills and training similar to the shipbuilding and repair workforce. The occupational composition of the workforce (Figure 11) was determined based on the percentage share of workers in each occupational category according to the larger Architectural & Structural Metals Manufacturing sector (NAICS 3323). Nearly half of the workforce is comprised of workers employed in Trades, Transport & Equipment occupations (48%) and one-in-five employed in Manufacturing & Utilities occupations (21%). The subsector largely employs trade workers in the metal trades (e.g., machinists, metal fabricators), and not as many in other skilled trades, such as mechanics and pipefitters, as in the shipbuilding and repair industry.

Figure 11: Occupational Structure – Architectural & Structural Metals Manufacturing (3323)
2006



2006 Labour Force - 6,985

Census

Table 10 details the Other Plate & Fabrication employment estimate by major occupation based on the larger Architectural & Structural Metals manufacturing sector in 2006. The estimate assumes the occupational breakdown for both sectors is equivalent and that the distribution has not changed since 2006. This 2012 estimate serves as the basis for calculating occupational projections for the Other Plate & Fabrication subsector through 2020.

Table 10: Employment Baseline by Occupational Category – Other Plate & Fabrication (2012)

Occupational Category*	Other Plate & Fabrication
Management (9%)	129
Natural & Applied Sciences (5%)	71
Business, Finance & Administration (13%)	186
Trades, Transport & Equipment (48%)	686
Manufacturing & Utilities (21%)	300
Other (4%)	57
Total Employment	**1,429**

** Architectural & Structural Metals (Census)*

4.2.5 Combined Employment (2012) – Shipbuilding & Repair + Other Plate & Fabrication

The combined industry workforce is estimated at 4,627 workers as of spring 2012. It is important to note that several other industry suppliers provide services, equipment and materials to the shipbuilding and repair industry. Businesses operating in the Other Plate & Fabrication subsector also supply other industries, yet those operating in the Lower Mainland and Vancouver Island/Coast are most likely to be impacted by the expansion of the shipbuilding and repair industry over the next 10 years and beyond.

Table 11: Combined Employment Estimate (2012)
Shipbuilding & Repair + Other Plate & Fabrication

	Shipbuilding & Repair	Other Plate & Fabrication	Total
Employment Baseline (2012)	3,198 (69%)	1,429 (31%)	4,627 (100%)

4.3 Occupational Growth Projections – 2016 & 2020

4.3.1 Shipbuilding & Repair Industry

Employment projections by occupation are based on anticipated growth through 2020 as identified by public and commercial employers. Overall employment demand is projected to increase by 47% over the next four years, and by a total of 62% through 2020. This translates into an average annual growth rate of 6.9% between 2012 and 2020 – significantly higher than the province's projected growth rate of 1.4% for all occupations over the same period[11].

[11] BC Labour Market Outlook: 2010-2020

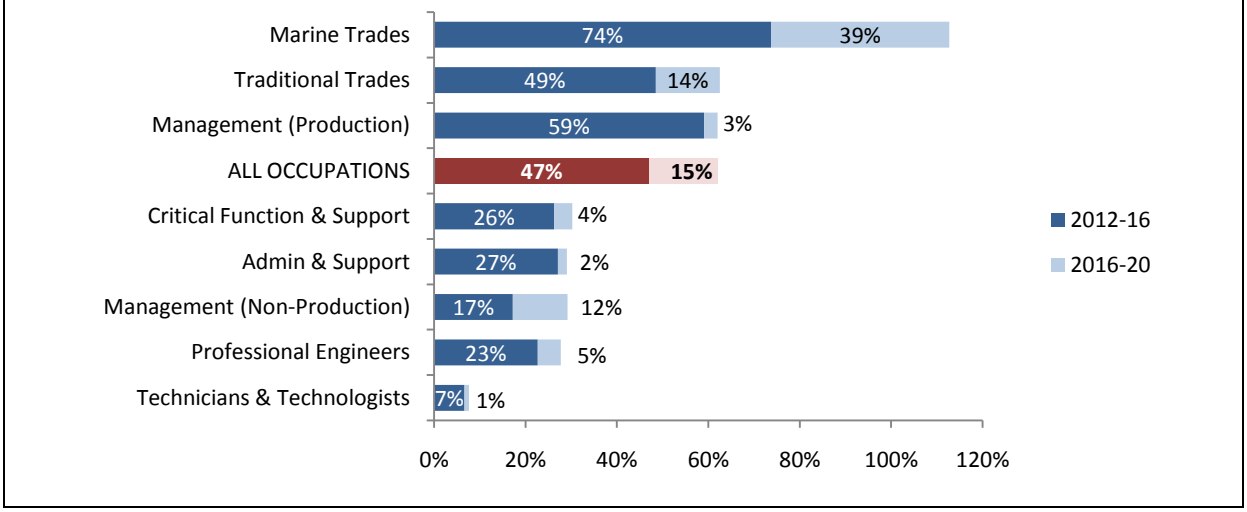
Employment growth is projected to occur mostly in the near term (2012-16), placing immediate pressure on employers to meet requirements through existing sources. In the longer term employers will be compelled to develop the workforce through increased training and upgrading, as competition for talent intensifies among related industries. Employment growth is projected to be highest in the marine trades (112%), traditional trades (63%), and production management occupations (62%), while growth among technologists and technicians is expected to lag other occupations. This result could be misleading, as skill shortages were reported highest amongst technologists and technicians, and the demands of new vessel construction require workers with a higher level of technical skill and knowledge.

Table 12: Occupational Projections – Shipbuilding & Repair Industry 2016 & 2020

Occupational Category	2012	2016	% Inc (2012-2016)	2020	% Inc (2012-2020)
Management (Non-Production)	41	48	17%	53	29%
Management (Production)	66	105	59%	107	62%
Critical Function & Support	197	247	26%	254	30%
Professional Engineers	27	32	23%	34	27%
Technicians & Technologists	164	174	7%	176	8%
Administration & Support	173	218	27%	221	29%
Traditional Trades	2,100	3,098	49%	3,391	63%
Marine Trades	452	780	74%	953	112%
Total	**3,198**	**4,701**	**47%**	**5,189**	**62%**

Figure 12 further highlights the impact of planned investments on BC's Shipbuilding & Repair industry. Employment in the marine trades is expected to more than double by 2020, with most of the growth occurring in the next five years.

Figure 12: Employment Demand by Occupational Category – 2016 & 2020



4.3.2 Other Plate & Fabrication

Expansion of the Shipbuilding & Repair industry will have a major impact on suppliers to the industry, including those that provide metal fabrication services to BC shipyards. In the absence of survey data from secondary employers (i.e., suppliers), occupational projections were calculated for the Other Plate & Fabrication subsector using employment multipliers provided through the BC Input-Output model and Statistics Canada[12]. Employment multipliers enable the calculation of direct, indirect and induced employment as measured in person years of employment, based on capital investments.

For this analysis, the employment multiplier used is that associated with the transportation engineering construction sector, which is closely related to the non-residential construction sector. A capital investment of $1 million in BC's transportation engineering construction sector is estimated to generate 6.34 person years of direct employment and 3.72 person years of indirect employment for the provincial economy. This analysis is interested in the *direct* employment impacts on the Other Plate & Fabrication subsector, as a result of planned investments in new vessel construction. It is further assumed that all direct employment impacts are attributed to BC's Shipbuilding & Repair industry and Other Plate & Fabrication subsector as located in the Lower Mainland and Vancouver Island/Coast.

Table 13 details the direct employment impacts for the Other Plate & Fabrication subsector as a result of planned investments in new builds. Based on the distribution of the combined workforce, 31% of direct new jobs would be generated in BC's Other Plate & Fabrication subsector, of which two-thirds would be located in the Lower Mainland and Vancouver Island/Coast (Section 4.2.3). Assuming baseline employment remains constant over this period, total annual employment is projected to increase steadily throughout most of the decade – more than doubling by 2017.

Table 13: Projected Employment – Other Plate & Fabrication
Lower Mainland & Vancouver Island/Coast (2012-2020)

	2012	2013	2014	2015	2016	2017	2018	2019	2020
Planned Investment (New Build)	*$5.0*	*$387.9*	*$770.3*	*$746.1*	*$953.6*	*$1,116.0*	*$1,158.0*	*$1,137.0*	*$470.6*
Total Direct Employment	32	2,459	4,884	4,730	6,046	7,075	7,342	7,209	2,984
Other Plate & Fabrication (31%):									
- British Columbia	10	762	1,514	1,466	1,874	2,193	2,276	2,235	925
- Lower Mainland & Vancouver Island/Coast	7	511	1,014	982	1,256	1,470	1,525	1,497	620
Baseline Employment (2012)	1,429	1,429	1,429	1,429	1,429	1,429	1,429	1,429	1,429
Total Projected Employment (Baseline + LM & VI/C)	**1,436**	**1,940**	**2,443**	**2,411**	**2,685**	**2,899**	**2,954**	**2,926**	**2,049**

[12] BC Stats. 2004 BC Provincial Economic Multipliers, March 2008.

Table 14 details projected employment impacts by occupational category within the Other Plate & Fabrication subsector. Similar to the shipbuilding and repair workforce, demand is greatest for trades workers and workers in manufacturing & utilities occupations – where employment is projected to exceed two thousand workers by 2017.

Table 14: Projected Employment by Occupational Category – Other Plate & Fabrication 2012-2020

Occupational Category	2012	2013	2014	2015	2016	2017	2018	2019	2020
Management (9%)	129	175	220	217	242	261	266	263	184
Natural & Applied Sciences (5%)	72	97	122	121	134	145	148	146	102
Business, Finance & Administration (13%)	187	252	318	313	349	377	384	380	266
Trades, Transport & Equipment (48%)	689	931	1,173	1,157	1,289	1,392	1,418	1,404	984
Manufacturing & Utilities (21%)	302	407	513	506	564	609	620	614	430
Other (4%)	57	78	98	96	107	116	118	117	82
TOTAL	**1,436**	**1,940**	**2,443**	**2,411**	**2,685**	**2,899**	**2,954**	**2,926**	**2,049**

4.4 Projected Job Openings – 2016 & 2020

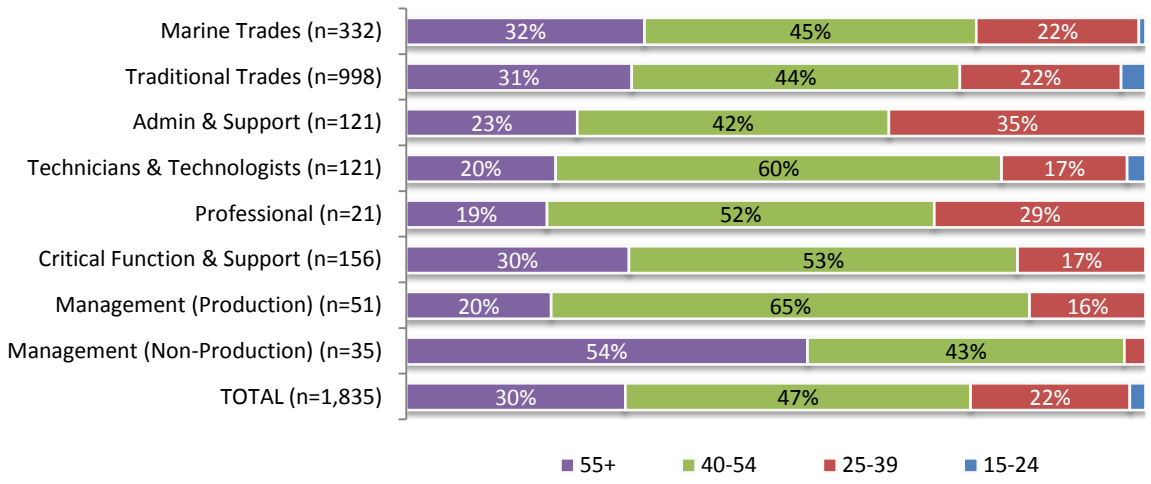
Meeting future requirements is exacerbated by the large percentage of the current workforce that is set to retire over the coming decade. The shipbuilding and repair industry workforce is aging and fewer younger workers are available to replace those leaving or about to retire. This is an overriding concern for industry, particularly as it prepares to expand and replace its workforce to meet projected demands.

4.4.1 Shipbuilding & Repair Industry

Survey results indicated that more than three-quarters (77%) of the current workforce is at least 40 years of age, including 30% who are 55 years or older and just 2% under the age of 25. Compared to the provincial labour force, the average age of trades workers in 2010 was 40.5 years[13]. This large cohort of older workers is likely attributed to the industry downturn beginning in the mid-1990s when significantly fewer new hires, including apprentices, were required. This extended hiring void is now challenging the industry's succession planning going forward, as fewer existing workers are available to fill job openings due to retirements. As detailed in Figure 13, all occupational categories are currently staffed by older workers, particularly those in management (non-production) occupations.

[13] BC Labour Market Outlook: 2010-2020

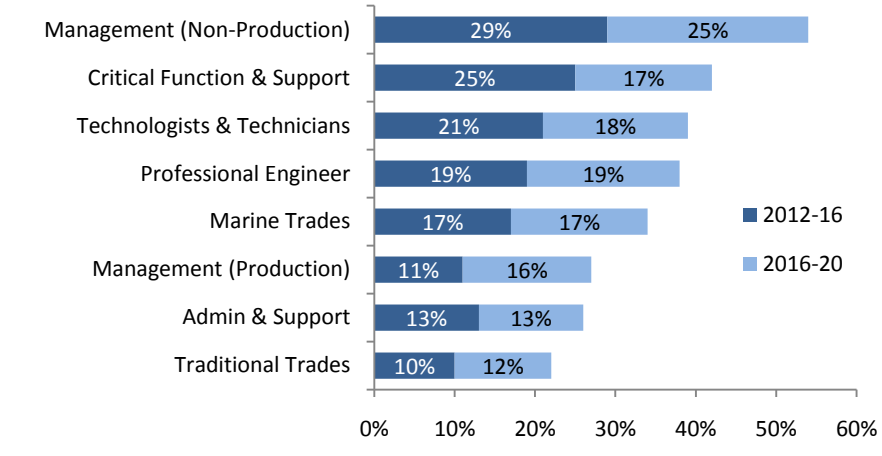
Figure 13: Age Demographic by Occupational Category – Shipbuilding & Repair Industry (2012)



Meeting future requirements will depend on the industry's ability to recruit, train and develop new workers to fill job openings resulting from both economic growth and workforce attrition (retirements). Employers indicated that 422 workers (13%) are expected to retire by 2016 and a total 846 by 2020 (26%), yielding an annual retirement rate of 3.3% through 2020. This compares to attrition rates of 2.4% for all provincial industries and 2.0% in the construction sector through 2017[14].

Retirement rates are anticipated to be highest in occupations that account for a relatively small percentage of the current workforce (i.e., management), and lowest in occupations that dominate the workforce (e.g., traditional trades). A lower retirement rate for production workers will, to some degree, ease employer concerns about immediate skills shortages in these high demand occupations.

Figure 14: Projected Retirements by Occupational Category – Shipbuilding & Repair Industry 2016 & 2020



[14] COPS B.C. Unique Scenario 2007-2017

Based on economic growth and replacement demand due to retirements, industry projections suggest 1,926 job openings will be available by 2016 and 2,838 by 2020 – representing 60% and 89% of the current workforce, respectively. Job openings are projected to be highest in traditional and marine trades, reflecting their high demand status and relative size within the industry workforce.

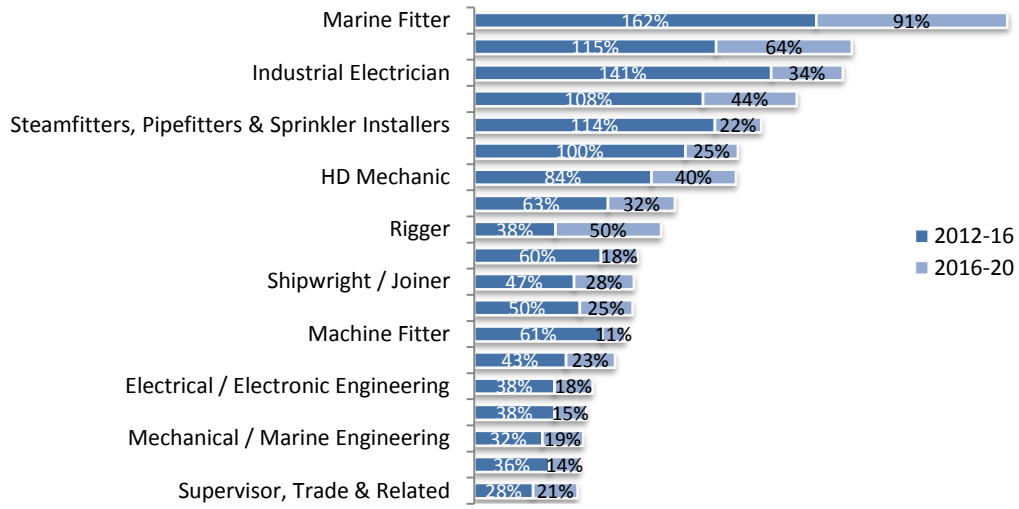
Table 15: Projected Job Openings by Occupational Category – Shipbuilding & Repair Industry 2016 & 2020

	2012	2012-16				2012-20			
Occupational Category	*Baseline*	*Retirees*	*Growth*	*Openings*	*% 2012*	*Retirees*	*Growth*	*Openings*	*% 2012*
Management (Non-Production)	41	12	7	19	46%	22	12	34	83%
Management (Production)	66	7	39	46	70%	18	41	59	89%
Critical Function & Support	197	49	51	100	51%	83	59	142	72%
Professional Engineers	27	5	6	11	41%	10	7	17	63%
Technologists & Technicians	164	35	11	46	28%	64	13	77	47%
Administration & Support	173	22	47	69	40%	45	50	95	55%
Traditional Trades	2,100	216	1,012	1,228	58%	453	1,306	1,759	84%
Marine Trades	452	76	331	407	90%	152	504	656	145%
TOTAL	**3,198**	**422**	**1,504**	**1,926**	**60%**	**846**	**1,992**	**2,838**	**89%**

See Appendix D – Projected Openings (all occupations)

Individual occupations within the traditional and marine trades categories are projected to experience the largest number of job openings through 2020. A total of 293 openings are projected for marine fitters by 2020 from a base of 116 workers in 2012, and a total of 451 openings for welders over the same period. Among non-trades occupations, 25 openings for job estimators are projected from the current base of 20.

Figure 15: Projected Job Openings – High Demand Occupations
Shipbuilding & Repair Industry



4.4.2 Other Plate & Fabrication

Projected job openings for the Other Plate & Fabrication subsector were developed based on the sector's average annual growth in employment for the years 2012-16 and 2012-20 (Section 4.3.2). Retirements over this period were calculated using the same retirement rates for each related occupation within the shipbuilding and repair industry. Based on economic growth and replacement demand due to retirements, 957 job openings are projected by 2016 and a total of 1,399 by 2020. Similar to the shipbuilding and repair industry, economic growth is the major driver of job openings through 2020.

Table 16: Projected Job Openings by Occupational Category – Other Plate & Fabrication
2016 & 2020

	2012	2012-16				2012-20			
Occupational Category	*Baseline*	*Retirees^*	*Growth**	*Openings*	*% 2012*	*Retirees^*	*Growth**	*Openings*	*% 2012*
Management	129	23	67	90	70%	48	88	136	105%
Natural & Applied Sciences	71	15	38	53	75%	28	50	78	110%
Business, Finance & Administration	186	35	98	133	72%	65	128	193	104%
Trades, Transport & Equipment	686	69	362	431	63%	151	474	625	91%
Manufacturing & Utilities	300	51	158	209	70%	102	207	309	103%
Other	57	10	30	40	70%	19	40	59	104%
TOTAL	**1,429**	**203**	**754**	**957**	**67%**	**412**	**987**	**1,399**	**98%**

(*) Annual average employment growth; (^) retirement rate per shipbuilding & repair

4.4.3 Total Job Openings – Shipbuilding & Repair + Other Plate & Fabrication

The combined number of projected job openings is 2,883 by 2016 and 4,237 by 2020, representing close to 100% of the current combined workforce. More than two-thirds of projected job openings will occur in the next five years.

Table 17: Total Job Openings – Shipbuilding & Repair + Other Plate & Fabrication 2016 & 2020

Sector	Baseline	Total Job Openings	
	2012	*2012-2016*	*2012-2020*
Shipbuilding & Repair	3,198	1,926	2,838
Other Plate & Fabrication	1,429	957	1,399
Total	**4,627**	**2,883 (68%)**	**4,237 (100%)**

4.5 Summary

Expansion of BC's Shipbuilding & Repair industry over the coming decade and beyond will have implications well beyond the shipbuilding and repair industry. Meeting future requirements will be challenged on several fronts, from replacing an aging workforce to attracting new workers from a narrowing pool of younger workers. In addition, industry employers will be competing for talent with related service providers, including businesses operating in the Other Plate & Fabrication subsector, and other industries with similar skill requirements. Given the increased demand for fabricated products and services going forward, smaller shipyard operators currently specializing in maintenance and repair may see opportunity in diversifying their operations to include the provision of fabrication services to BC shipbuilders.

SECTION 5: MEETING THE HUMAN RESOURCE CHALLENGE

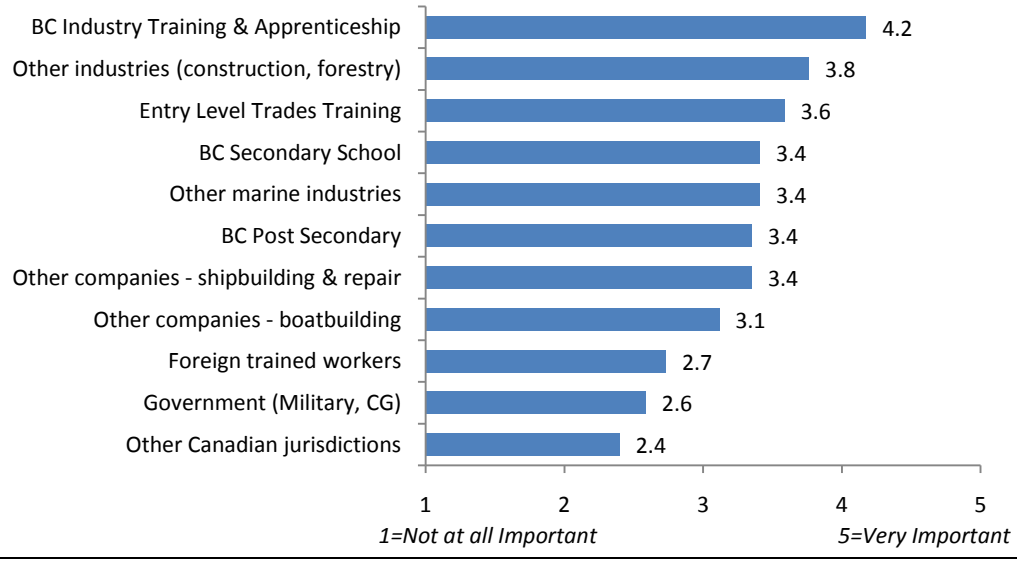
Meeting the needs of the industry workforce will be challenged on many fronts, as competition for skilled workers intensifies. The Shipbuilding & Repair industry competes with several other industries for similar workers, and training support programs do not exist for many occupations, including all marine trades. Post secondary education and apprenticeship programming is widely used among larger employers, whereas smaller establishments tend to train workers on-the-job.

The introduction of the National Shipbuilding Procurement Strategy (NSPS) and the industry shift towards new vessel construction demands a workforce with skills sets and knowledge quite distinct from that required for maintaining and repairing vessels. Over the last decade and more, maintenance, repair and refits have been the primary activities of BC shipyards. This has contributed to the development of a highly skilled workforce in these areas of activity, while workers skilled in the construction of new vessels have had fewer opportunities to maintain their skills or help mentor the next generation of shipbuilders. In this respect, the new build program under the NSPS is considered a *once-in-a-generation* opportunity to train and develop a shipbuilding workforce capable of serving the industry well beyond 2030.

5.1 Current Sources of Labour

Employers and unions who participated in the survey were asked to indicate the level of importance they attribute to the various sources of labour to the shipbuilding and repair industry. The province's industry training system was identified as the most important source of labour. This result is supported by the high percentage (73%) of the current workforce that possesses either an industry training or post secondary credential. Shipyard employers and unions also placed a high level of importance on recruiting workers from competing industries, including construction and forestry.

Figure 16: Importance of Sources of Labour to the Shipbuilding & Repair Industry

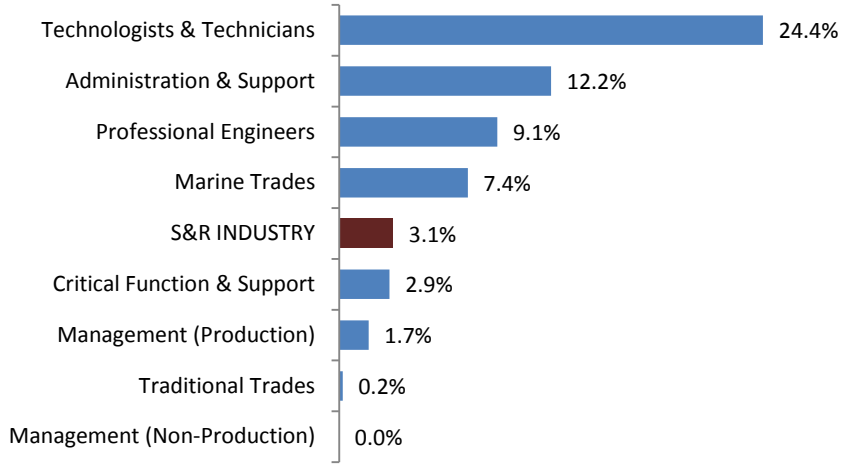


Employers generally felt that the identified sources of labour were "adequately" meeting their needs for traditional trades workers, yet problems were evident recruiting marine trades workers and specialized workers, including critical function and support specialists. These comments were qualified by the current slowdown in the BC industry and that the real challenge will be in meeting future requirements in all high demand occupations. Smaller shipyard operators, most of which specialize in maintenance and repair activities, were less concerned than larger employers with current skills shortages. Most indicated that their current needs were being met through existing sources.

5.1.1 Vacancies (Current Skills Shortages)

With the exception of technologists and technicians (and possibly marine trade workers), employers in general had little difficulty hiring skilled workers to meet current requirements. Much of this can be attributed to lower levels of economic activity in the current environment. Perhaps surprising is the absence of job openings for traditional trade workers that dominate the industry workforce. An industry vacancy rate of 3.1% would suggest that overall workforce requirements are adequately being met at this time.

Figure 17: Current Skills Shortages (2012)



5.1.2 Current Apprentices

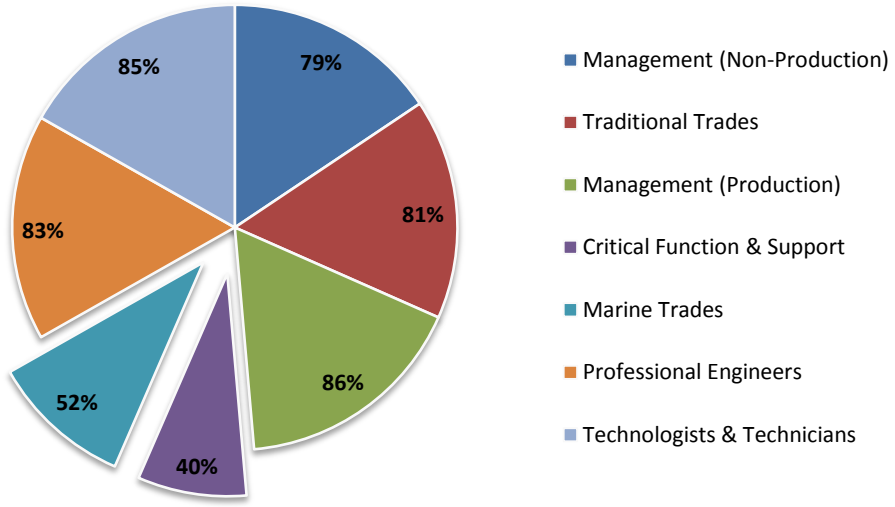
Lower levels of economic activity and a workforce geared primarily towards maintenance, repair and refit activities have contributed to fewer apprentices being training throughout the industry. At the time of the survey, employers reported a total of 2,100 workers employed in the traditional trades, including 140 registered apprentices or 7% of this workforce. Based on an annual retirement rate of 3.3% (or 70 workers per year) this number of apprentices would not be considered sufficient to maintain the current workforce, let alone expand the workforce for future developments. The situation is more concerning among the industry's 452 marine trades workers, where just 15 are registered in a related apprenticeship. Without the support of formal training programs, recruitment

and development of the marine trades workforce will be seriously challenged in meeting employment growth and replacement demands over the coming decade.

5.2 Importance of Formal Training & Education

BC's shipbuilding and repair industry requires a highly skilled and trained workforce. Employers indicated that nearly three-quarters (73%) of the workforce possesses either a post secondary education or training credential. Most traditional trade workers (69%) possess a BC TQ, Red Seal or both, while 42% of marine workers possess similar credentials. The importance of formal training cannot be overstated, as skills shortages are amongst the highest in those occupations where training programs are lacking or do not exist (i.e., Marine Trades and Critical Function & Support). Figure 13 highlights the two occupational categories that contain the largest number of industry workers *without* a credential. Both categories are considered high demand, and neither is well supported by formal training programming.

Figure 18: Importance of Training & Education
% of Workers with a Training or Education Credential



5.3 Gaps in Training & Education

Employers were asked whether gaps in training exist for the various occupational categories identified in this study. Many felt that "experience" in the marine industry was critical, yet most training programs do not expose workers to the uniqueness of the marine environment. There was a general understanding that training for all skilled and technical occupations requires a marine focus, and that hands-on experience was central to successful training.

5.3.1 Production Management & Critical Function Support Specialists

Employers identified the growing need for formal production management training and that this area of expertise has to be developed from within the experienced shipbuilding and repair workforce. Traditionally, project managers in the industry were former trades' workers who became supervisors, overseeing increasingly diverse teams and developing broader knowledge and experience of ship building and repair operations. With demands of the position becoming increasingly complex, it is no longer sufficient to simply promote senior trades' workers into these positions. It was suggested that the best method of addressing this gap is to implement management upgrading to allow experienced workers to acquire both the broad experience and particular skill sets to become effective mid-management production workers. Specific training programs identified include planning, estimating, purchasing and costing. Formal training programs that support these functions (e.g., BCIT) are not marine focused.

Similar issues were raised with respect to the need for qualified supervisors to manage shipyard operations. Similar to project managers, many of these workers are drawn from the experienced pool of trade workers, who are then made responsible for managing various components of the production process. In traditional shipyard operations, the role of supervisor has largely focused on organizing staff for the purpose of production. Today, however, specific skills sets are required of supervisory staff that includes human resource management, information management, time management, budgeting, labour relations and communication.

5.3.2 Traditional & Marine Trades

Apprenticeship and foundation training is available in all "traditional" trades required by the Shipbuilding & Repair industry. Public and large commercial employers rely on apprenticeship training due to the size of their workforces and scope of operations, while smaller operators rely more on in-house training and foundation programming owing to their multi-task environments. Because of the reality of contract work in the industry, employers have tended to retain a smaller core of qualified workers and hired others on a temporary basis as needed. Apprenticeship training, as a result, has been conducted on a limited basis with many apprentices released prior to program completion. This has been a major setback for the industry, as it stemmed the flow of new entrants into the industry, contributed to a loss of qualified "marine" workers to other industries, and reduced the number of younger skilled workers able to replace those nearing retirement. While apprenticeship training remains vital to meeting future skill requirements, experience in the marine environment is considered equally important to ensuring a productive workforce.

Of greater concern to employers generally is the lack of training programming in support of the marine trades, which were de-listed in BC many years ago. Marine trades workers often rely on traditional trades training in related apprenticeship programs to help prepare them for employment or career development in the industry. The absence of formal training programs for marine trades has resulted in an inadequate human resource succession plan for the industry. Greater effort is needed to re-institute marine trades training into the provincial apprenticeship system that meets the needs of industry and trainees. The development of a marine industry endorsement for new entrants was identified as a priority, particularly among smaller operators.

5.3.3 Professional & Technical Workers

Naval architecture/engineering is a high demand occupation with application on a global scale. Expertise in this area is largely concentrated in private companies that provide engineering and design services to shipbuilders throughout the world. While British Columbia is home to internationally recognized naval architectural firms, ship designers are typically trained and recruited from other jurisdictions, including nationally and internationally. While graduates of related engineering programs (e.g., mechanical) from BC institutions find gainful employment with naval architectural firms, only Memorial University (Newfoundland), Dalhousie (Nova Scotia) and the Insitut Maritime du Québec (Quebec) offer post secondary naval architecture and engineering programming in Canada.

Although technologists and technicians represent a small share of the industry workforce, employers indicated that current skills shortages were highest among this category of worker. Engineering technologists and technicians are in growing demand due to their ability to install and maintain specialized equipment for federal and provincial fleets. Commercial shipyards are also looking to recruit more specialized production workers due to the increasing complexity of manufacturing technologies, and particularly in the construction of new vessels. Post secondary institutions throughout BC offer a broad range of technologist and technician programs (accredited through the Canadian Technology Accreditation Board) with application to the Shipbuilding & Repair industry. Several employers indicated that a mechanical engineering technology program specific to the marine industry would be a valued development for the industry.

5.4 Human Resource Challenges Facing Industry Suppliers

While the survey of employers and unions in the Shipbuilding & Repair industry was directed primarily at BC shipyard operators, there are many supporting industries that are essential to the effective functioning of the Shipbuilding & Repair industry. These include suppliers of goods and services to the industry, and firms specializing in naval architecture and design, metal fabrication and project management.

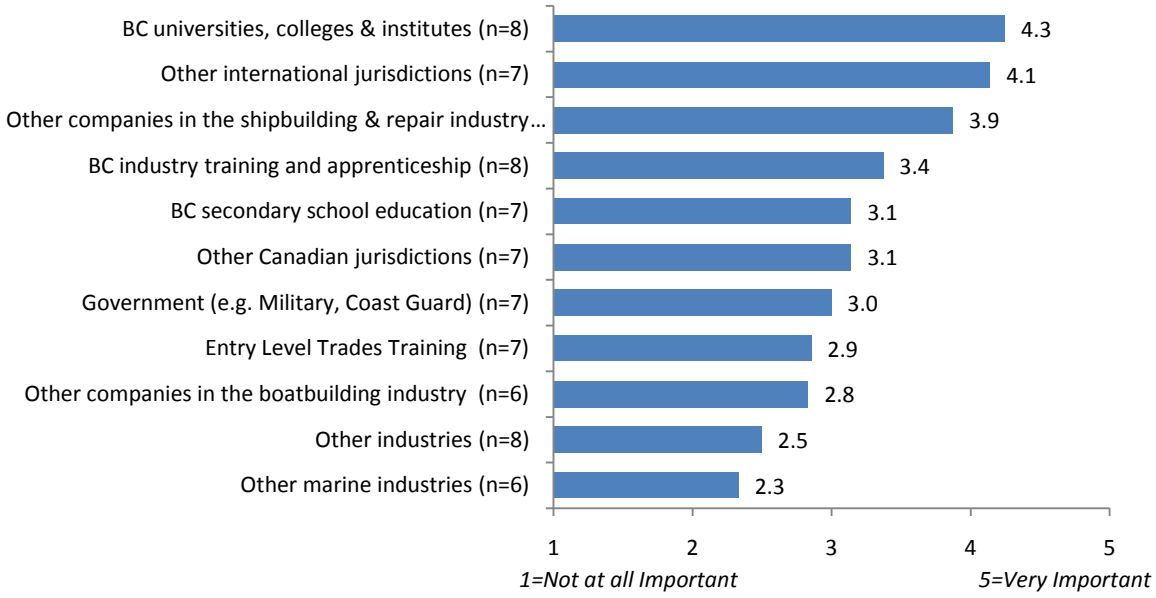
A significant challenge with collecting workforce data from industry suppliers (i.e., secondary employers) is in defining the scope of the secondary workforce. The companies supplying goods and services to the industry range from small local companies who specialize in the marine sector, to multinational corporations which may have a division dedicated to shipbuilding. In addition, there are many companies who supply goods and services to a number of different industries, with shipbuilding making up only a minor portion of their overall business. As a result of these challenges, the workforce data provided by secondary employers could not be extrapolated to represent all secondary employers. However, the survey did provide some useful qualitative information regarding sources of labour, training and other human resource issues facing the industry.

5.4.1 Sources of Labour

Employers were asked to rate the importance of a number of potential sources of new labour. Many of the secondary employers require workers with a university level education, resulting in the high score for BC universities and colleges. One employer also mentioned other Canadian universities (in particular Memorial University) as an important source of naval architects. Employers also found

other companies within the Shipbuilding & Repair industry to be a more important source of labour than companies in other industries. Foreign trained workers were also identified as an important source of labour for secondary employers.

Figure 19: Sources of Labour – Importance
Survey of Secondary Employers



Employers were also asked to comment on whether the above sources of labour were adequate to meet their anticipated workforce requirements. Employers were split on the issue, with five indicating that current sources of labour were sufficient, while four indicated that they were not. Some employers noted that Canadian university programs, (e.g., UBC and Memorial University) were sufficient to meet their needs in areas such as engineers and technical staff, while others indicated that their needs were met only through the recruitment of foreign trained workers. Shortages of available workers were noted in the trades, and specifically for workers with marine training or experience.

5.4.2 Training Gaps

In addition to the general comments regarding the availability of qualified workers, employers were asked to identify specific training gaps within various occupational categories. These results are summarized in the following Table 18. While some comments were unique to each occupational category, an overall theme running through most responses is a need for training specific to the marine environment for each occupational category.

Table 18: Training Gaps by Occupational Category – Secondary Employers

Occupational Category	Training Gaps (# employers)	Summary of comments – Gaps in Training
Management Workers	Yes: 5	• Knowledge of BC Marine suppliers, risk management lacking • Limited knowledge of the marine industry • Not enough training for estimators, job planning & scheduling • Training specific to marine • Would like to see better/more available project management and time management courses (e.g., BC Construction Association).
	No: 4	• All employees are university trained • In general our managers are taken from the technical ranks, internally
Professional Engineers, Technologists & Technicians	Yes: 8	• Little to no knowledge of marine engineering at the mechanical, hydraulic or controls engineering level • Knowledge of marine engineering, especially material science. • Mechanical Engineers, Naval architects • Would like to see better/more available project management and time management courses (e.g., BC Construction Association). • Ships are built overseas; foreign technicians are more familiar with foreign built ship systems • Training specific to marine
	No: 1	• UBC needs a better Naval Architecture program.
Critical Function & Support Specialists	Yes: 3	• Estimating, planning, quality assurance, quality control • Knowledge of Canadian marine suppliers base, concept of engineering material substitution, ability to estimate complex jobs • Training specific to marine
	No: 5	• Filled internally from tech staff to date
Traditional Trade Workers	Yes: 4	• Hard to find experienced people who want to work • Steel fabricators, 'A' level welders, machinists • Trades people not interested in upgrading due to the lack of available marine work
	No: 3	
Marine Trade Workers	Yes: 3	• We need a local marine academy that teaches marine mechanics, hydraulics & controls engineering • Training specific to marine
	No: 2	

Most secondary employers indicated that they wished to participate in the development of an overall human resource strategy for the shipbuilding and repair industry. Five of the nine employers surveyed reported having some sort of human resource strategy, although not all strategies were formal, long term plans. The provision of more workplace training opportunities (i.e., co-ops, internships, apprenticeships) for all categories of worker was identified as an important strategy to developing the future workforce. Several employers also emphasized the need for marine-specific training, potentially through the development of a marine training facility such as the Industrial Marine Training & Applied Research Centre (IMTARC).

5.5 Summary

Public and commercial employers, suppliers and other stakeholders were consistent in their assessment of the need for specific marine training to meet current and future requirements. The demand for skilled workers encompasses all aspects of the planning and production process, from entry level to management. Increasing demand for production management, supervisory and marine trades training is particularly evident, as is the need to familiarize all new entrants on the operations of the shipbuilding and repair environment.

The demand for training has reached a critical point, as alternative sources, such as hiring from other companies and industries, is no longer considered a viable long term strategy. Other industries with similar workforce profiles face many of the same recruitment challenges as BC's Shipbuilding & Repair industry. This is the case with the industry's key supply sector (Other Plate & Fabrication) which shares similar occupational requirements with BC shipyards. Competition for younger skilled workers is fierce across manufacturing, construction, and related sectors, highlighting the importance of recruiting, training and developing workers from within the industry.

The industry has undergone a setback over the last two decades, owing to economic fluctuations and the consequent *ad hoc* approach to training and skills development. With the launch of the new build program, employers will have the opportunity to better plan and develop a qualified workforce that can be sustained in the long term.

SECTION 6: SUPPLY ANALYSIS – SOURCES OF LABOUR

To better understand the potential supply of workers to the industry, the study includes an examination of participation rates and outcomes in BC training programs relevant to the shipbuilding and repair industry. This analysis focuses on high demand occupations, including select traditional and marine trades, professional and technical, production management, and critical function and support occupations. While the marine trades have also been identified as high demand occupations, none are directly supported by specific industry training programming.

The supply-side analysis is supported by an assessment of the various sources of labour, including partnerships with various unions, local employment and training agencies serving the Aboriginal workforce, and immigration programs that facilitate entry of foreign trained workers into BC and Canada. Opportunities for recruitment and training development were also explored for the purpose of helping address future requirements in BC's Shipbuilding & Repair industry. A risk review has also been completed that examines the workforce implications of major projects in BC and Alberta, as well as demand-supply projections in select occupations in neighbouring jurisdictions.

It should be emphasized that the supply side analysis should be viewed as a "static" analysis, as the study is based on graduate employment data collected for the period from 2009-2001, and does not necessarily reflect supply side scenarios that may unfold in the next ten years. For example, while the study assumes that the total supply of unemployed graduates will be available to work in the marine sector, in reality, many other sectors will also have need of, and demand for, such available workers. In this context, the supply side analysis presented in this report should be viewed as a "best case" scenario, as growth / demand in other sectors will most likely reduce the pool of workers available to the marine sector.

6.1 Training Program Inventory & Outcomes Analysis

The following provides an inventory of provincial education and training programs in support of select occupations in shipbuilding and repair. Associated with each program is an analysis of participant outcomes (i.e., completers, employment) that is used to help determine the potential supply of existing graduates that may be available for recruitment into the shipbuilding and repair industry. The analysis also discusses each program's capacity to help meet future training requirements in each occupation. An inventory of select provincial and national programs is also provided in Appendix E.

6.1.1 Traditional & Marine Trades

Provincial training programs in support of the Shipbuilding & Repair industry are largely geared towards the traditional trades, such as electricians, machinists and piping trades, and include a range of formal apprenticeship and foundation or entry level programs. Apprenticeship training is supported by larger operators in the industry, with smaller companies more dependent on in-house and on-the-job training. Specific training programs in support of the "marine" trades, such as marine fitter and shipwright, were de-listed many years ago, with most employers today relying on a mix of related trades training and on-the-job

training to meet requirements. Employers are in agreement that trades' training in support of the marine trades is inadequate to meet industry's current and future needs, regardless of economic prospects.

Table 19: Trades Training Programming – Traditional Trades (Select)

Traditional Trades	*Job Openings 2020 [Survey]*	*Education & Training*		*Outcomes (2009-2011)*				*Annual Job Openings*	*Annual Surplus/ (Gap)*
Select Occupation		*Institution*	*Program*	*Average Enrolment [A]*	*Average Graduates [B]*	*% Employed [C]*	*Potential Supply [D]=B(1-C)*	*[E]*	*[D-E]*
Supervisor, Trade & Related Workers	135	BCIT	Operations Mgmt, Supervisor (Diploma, Cert.)	45	45	83%	8	17	**(9)**
Machinist	34	BCIT CNC Selkirk	Apprenticeship	200	91	89%	10	4	**6**
Pipefitter & Sprinkler Installer	223	BCIT Camosun 1 Private	Apprenticeship	197	75	97%	2	28	**(26)**
Plumber	55	9 Public 2 Private		824	206 (Est.)	88%	25	7	**18**
Electrician (Industrial)	227	TRU CoR	Apprenticeship	88	34	88%	4	28	**(24)**
Electrician (Construction)	49	14 Public 2 Private		4,018	1,027	87%	134	6	**128**
Welder – Level A/B	451	13 Public PIAB	Apprenticeship	656	620	77%	143	56	**87**
Painter (Industrial)	66	Finishing Trades Institute	Apprenticeship	N/A	N/A	N/A	--	8	**--**
Millwright /Industrial Mechanic	21	7 Public	Apprenticeship	559	121	88%	15	3	**12**
Heavy-Duty Equipment Mechanic	31	10 Public	Apprenticeship	795	139	97%	4	4	**0**
Machine Fitter	118	Other Apprenticeship	Apprenticeship (Diesel Mechanic)	227 (Est.)	57	97%	2	15	**(13)**
			Apprenticeship (Millwright)	559	121	88%	12	13	**(1)**
			Apprenticeship (HD Mechanic)	795	139	97%	0	1	**(1)**

Based on current training outcomes (Table 19), annual skills gaps are identified in four of the nine select traditional trades, including supervisor (9), pipefitter and sprinkler installer (26), industrial electrician (24) and machine fitter (13). Further examination of outcomes in the piping and electrical trades suggests that current gaps could be addressed by recently trained workers in related trades (i.e., construction electrician and plumber). With respect to machine fitters, BC does not offer a specific program in this trade, as training is accessed through related programming (including diesel engine mechanic, heavy duty mechanic and millwright). With the exception of supervisor, which

does not have an associated training program, all other programs in support of the trades have system capacity (i.e., seats) at this time to expand programming to accommodate demands. Accessing training for supervisors will remain a challenge as the only publicly available program is that offered by BCIT which serves a broad range of industries. Employers in the Shipbuilding & Repair industry cite the need for more of an upgrading program to transition experienced production workers into supervisory level positions.

Meeting future requirements in the marine trades is challenged by a lack of available formal training in all occupations. Workers in the marine trades typically rely on a mix of on-the-job training and formal training in a related training program. For example, marine fitters may receive training through the province's metal fabrication apprenticeship program, and shipwrights may be trained as a joiner or carpenter. With the exception of marine fitters, job openings in the other marine trades could potentially be filled by graduates of related apprenticeship training programs. As with machine fitters, job openings for marine engine mechanics could be filled by graduates of related apprenticeships, including diesel engine mechanic, millwright or HD mechanic. In the absence of outcomes from these related training programs, skills gaps would necessarily be filled through other supply sources, or shortages will persist.

Table 20: Trades Training Programming – Marine Trades (Select)

Marine Trades	*Job Openings 2020 [Survey]*	*Education & Training*		*Outcomes (2009-2011)*				*Annual Job Openings*	*Annual Surplus/ (Gap)*
Select Occupation		*Institution*	*Program*	*Average Enrolment [A]*	*Average Graduates [B]*	*% Employed [C]*	*Potential Supply [D]=B(1-C)*	*[E]*	*[D-E]*
Marine Fitter	293	Training Gap	Related Apprenticeship (Metal Fabricator)	241	67	77% (per Welder)	15	37	**(22)**
Marine Engine Mechanic	110	Training Gap	Related Apprenticeship (Diesel Mechanic)	227 (Est.)	57	97%	4	14	**7**
			Related Apprenticeship (Millwright)	559	121	88%	15		
			Related Apprenticeship (HD Mechanic)	795	139	97%	2		
Shipwright	56	Training Gap	Relate Apprenticeship (Joiner)	264	62	83%	11	7	**4**
Sand Blaster	88	Training Gap	Related Apprenticeship (Industrial Painter)	N/A	N/A	N/A	--	11	**--**

6.1.2 Professional & Technical

British Columbia's post secondary system does not offer specific programming in naval architecture and engineering despite demand for graduates in BC and other jurisdictions, both nationally and internationally. In Canada, Newfoundland's Memorial University (Fisheries & Marine Institute), Nova Scotia's Dalhousie University (Centre for Marine Vessel Development and Research), and Quebec's

Institut Maritime du Québec are of the few Canadian institutions providing diploma and degree programs in naval architecture and engineering. Memorial University also offers a post graduate certificate program in Project Management with applicability to the shipbuilding and repair industry (as sponsored by the Fisheries & Marine Institute). The objective of this course is to familiarize participants with modern processes and tools involved in initiating, planning, executing, controlling, and closing projects. Many of the courses offered through this online program are relevant to the current project management needs of BC's shipbuilding and repair industry.

A range of other technical and technology programs exist throughout the provincial post secondary system. BCIT and North Island College, for example, provide a diploma program in Marine Engineering that trains students in the operation and maintenance of ship propulsion systems and other machinery. While marine specific, these Transport Canada certified programs prepare graduates for careers at sea, and not in the actual construction or repair of vessels in shipyards. Nevertheless, these individuals are highly trained and capable of adapting to shipyard operations. Similar programs exist throughout other Canadian jurisdictions, including Newfoundland, Quebec and Ontario.

Upon examination of outcomes of mechanical and electrical technology and technician training programs offered in BC, the system has the capacity to produce sufficient graduates to meet industry requirements (not just shipbuilding), as demonstrated by the relatively high percentage of unemployed graduates. This outcome may, however, be due to the high number of graduates who pursue further studies upon graduating from these programs. Nevertheless, given the value of these program graduates to the Shipbuilding & Repair industry, targeting these graduates through a workforce strategy may prove beneficial.

Table 21: Technical Training Programming – Select Occupations

Technicians & Technologists	*Job Openings 2020 [Survey]*	*Education & Training*		*Outcomes (2009-2011)*				*Annual Job Openings*	*Annual Surplus/ (Gap)*
Select Occupation		*Institution*	*Program*	*Average Enrolment [A]*	*Average Graduates [B]*	*% Employed [C]*	*Potential Supply [D]=B(1-C)*	*[E]*	*[D-E]*
Mechanical Engineering	32	BCIT Camosun Okanagan	Mechanical – Design Manufacturing – Industrial Mechanical Systems	610	125	75% (Est.)	31	4	**27**
Marine Engineering		BCIT	Marine Engineering (Transport Canada)	193	5	100% (Est.)	0		
Electrical / Electronic Engineering	28	BCIT Camosun North Island Okanagan	Electrical Power/Industrial Control Electronics and Computer Network & Electronics Technician	770	200	71%	58	4	**54**

6.1.3 Production Management / Critical Function & Support

Project management programs are widely available in both private and public training institutions throughout British Columbia. These programs range in length and detail depending on the purpose and applicable industry or workplace. Many of the programs qualify for recognition through the Project Management Institute.

Table 22: Production Management & Specialized Training Programming – Select Occupations

Production Management	*Job Openings 2020 [Survey]*	*Education & Training*		*Outcomes (2009-2011)*				*Annual Job Openings*	*Annual Surplus/ (Gap)*
Select Occupation		*Institution*	*Program*	*Average Enrolment [A]*	*Average Graduates [B]*	*% Employed [C]*	*Potential Supply [D]=B(1-C)*	*[E]*	*[D-E]*
Manufacturing / Operations Manager	8	BCIT	Manufacturing (Bachelor of Technology) Operations Management (Diploma)	56	28	78%	6	1	**5**
Purchasing Manager	7						5	1	**4**
Construction/ Project Manager	31	BCIT	Construction Management (Bachelor of Technology)	100 (2010)	35 (2010)	--	--	4	**--**
Program Manager	11	BCIT	Operations Management (Certificate – Management Engineering)	Continuous	N/A	N/A	4	1	**3**
Procurement, Logistics & Material Management	45	BCIT	Operations Management (Certificate – Materials)	Continuous	10	90% (Est.)	3	8	**(5)**
Job Estimating	25	BCIT	Operations Management (Certificate – Industrial Engineering)	Continuous	N/A	N/A	--	5	**(5)**
Quality Assurance/ Quality Control	33	BCIT	Operations Management (Certificate – Quality Management)	Continuous	N/A	N/A	--	6	**(6)**
Planning & Scheduling	39	BCIT	Construction Operations (Associate Certificate)	Continuous	N/A	N/A	--	7	**(7)**

For a program with applicability to the shipbuilding and repair industry, BCIT offers a bachelors degree in Construction Management (Technology), as well as diploma and certificate programs in Construction Supervision and Operations Management for eligible applicants, including experienced workers. These programs encompass many of the project management requirements of the shipbuilding and repair industry, including risk management, cost and value management, planning

and procurement, and could serve as a model for development in BC's shipbuilding and repair industry. In addition, graduates of BCIT's diploma program in Operations Management are eligible for continuing education and certification in a variety of professional organizations, including Certification in Production and Inventory Management (CPIM), Certification in Supply Chain Professional (CSCP), American Society for Quality (ASQ), Supply Chain Management Professional (SCMP), and the Canadian Institute of Quantity Surveyors (Construction Management).

Examination of outcomes from these identified programs suggests that annual job openings may be filled by graduates in programs applicable to higher level management occupations (e.g., manufacturing managers and purchasing managers). Ongoing difficulty is anticipated filling annual job openings in more specialized occupations, such as job estimating, materials management, quality assurance and planning related occupations. All Shipbuilding & Repair employers indicated difficulty filling these specialized occupations.

6.2 Labour Partnerships

Labour unions play a vital role in the training and development of the shipbuilding workforce. Several shipyard operators have established relationships with unions, including the Marine Workers Union in Vancouver and the Boilermakers in Victoria that provide qualified workers in metal fabrication and related marine trades. Other building trade unions (i.e., traditional trades), including pipefitters, electricians and labourers, are also active in the provision of workers as required. Most building trade unions supply workers to the commercial construction industry as their primary market. Shipbuilders would compete with construction and other industries for similarly skilled workers.

Tabled below are the unions that participated in the survey who identified the number of skilled workers that are currently members of their organization. All indicated that the number of unionized workers would grow substantially over the next decade in response to demand from proposed developments in shipbuilding and related industries. Further, union representatives indicated that they have an available supply of skilled workers to meet current requirements.

Table 23: Labour Union Supply

Labour Partner	Trades	Current Members	% SRI	2016		2020	
				Openings	Capacity	Openings	Capacity
Marine Workers & Boilermakers 1 (Vancouver)	Welders, Mechanics, Machinists, Marine Trades, Helpers	433	80%	-	Yes	-	Yes
Boilermakers 191 (Victoria)	Fabricators, Welders, Trades Helpers	400	80%	289	Yes	451	Yes
Machinists 3 (Victoria)	Machinists	600	40%	22	Yes	34	Yes
Machinists 692 (Vancouver)		2,000	7%				
Painters & Allied 138 (Victoria)	Painters (Sandblasters, Sprayers), Labourers	230	10%	43	Yes	66	Yes
Painters & Allied 38 (Vancouver)		-	-				
Carpenters 1598 (Victoria)	Carpenters, Joiner	725	5%	22	Yes	41	Yes
Carpenters 1995 (Vancouver)		-	-				
Sheet Metal 276 (Victoria)	Sheet Metal	57	10%	15	Yes	26	Yes
Sheet Metal 280 (Vancouver)		1,800	-				
IBEW 213 (Vancouver)	Electricians, Construction & Industrial (Other)	-	-	197	Yes	276	Yes
IBEW 230 (Victoria)		2,150	10%				
Plumbers & Pipefitters 324 (Victoria)	Plumbers, Pipefitters & Sprinkler Installers	200	20%	225	Yes	278	Yes
Plumbers & Pipefitters 170 (Vancouver)		-	-				

6.3 Aboriginal Workforce

Based on the results of employer survey, Aboriginal workers represent about 5% of the current industry workforce. Census data further illuminates the potential for increased participation of Aboriginal workers in the shipbuilding and repair workforce. A relatively high percentage of Aboriginal workers possess skills, training and formal qualifications relevant to high demand occupations in the Shipbuilding & Repair industry.

Various Aboriginal employment agencies in Victoria, Vancouver and throughout British Columbia provide skills training and employment services to members in local areas. Aboriginal Skills Employment & Training (ASET) agencies are community-based organizations funded by Human Resources and Skills Development Canada to provide employment and training services to Aboriginal clients. ASETs serve a defined geographic area and help to establish partnership agreements (i.e., Aboriginal Skills and Employment Partnerships or ASEPs) with local industry and training institutions to facilitate Aboriginal participation in the Canadian workforce. There are several ASETs currently

serving Aboriginal clients in the Lower Mainland and Vancouver Island/Coast whose members possess skills and experience applicable to the shipbuilding and repair industry.

- Aboriginal Community Career Employment Services Society (ACCESS) is the only urban ASET in British Columbia serving urban Aboriginal clients throughout Metro Vancouver. Its mandate is to enhance human resource development and the sustainable capacity of the urban Aboriginal population in Metro Vancouver through the provision of employment and training services. ACCESS has almost 300 active (working) apprentices in 29 different trades, and a total of 33 clients with a Red Seal and/or Provincial Trade Qualification. The following is an occupational breakdown of some of the clients with skills and training applicable to marine industry.

Table 24: Aboriginal Labour Supply (ACCESS) – Select Occupations

	Current Apprentices - Level				Journeypersons	Total
Trade	*I*	*II*	*III*	*IV*	*Red Seal/TQ*	*Totals*
Pipefitter	14	5	10	5	13	47
Sheet Metal	9	1	-	-	1	11
Metal Fabrication	-	3	1	-	1	5
Welding	16 (C)	4 (B)	-	-	-	20
Painter-Decorator	3	2	-	-	-	5
Electrician	3	3	2	1	1	10

Source: Aboriginal Community Career Employment Services Society

- First Nations Employment Society (FNES) provides skills assessment, training and career placement in a number of trades relevant to BC's shipbuilding and repair industry, including marine engine mechanics and supply chain managers. FNES represents ten First Nations and *on-off* reserve residents located in Vancouver and the Sunshine Coast. FNES has established Aboriginal Skills Employment Partnerships with various industries, including the supply chain sector (i.e., Port of Vancouver, Asia Pacific Gateway Skills Table, and Supply Chain Sector Council) and the construction industry (i.e., Scott Construction). FNES has an estimated membership of close to 1,000 members with varying levels of skills and experience, many of whom have experience working in BC shipyards.

- Métis Nation British Columbia (MNBC) administers the Métis Employment & Training Program (METP) to improve employment potential, earnings capacity and self-sufficiency of the Métis people in British Columbia. MNBC represents 37 chartered communities in British Columbia and is mandated to develop and enhance opportunities for Métis communities by implementing culturally relevant social and economic programs and services.

6.4 Migrant Workforce

Meeting the requirements of the future shipbuilding and repair workforce will, in part, be addressed through international immigration and in-migration from other parts of British Columbia and Canada. As reported in Section 2.2.4, the shipbuilding and repair workforce is comprised largely of workers from the local population (78%) with an equal share of workers from other provinces (3%) and internationally (3%). Attracting and recruiting high demand workers from the various jurisdictions will be important in the face of increasing competition for skilled workers from other industries and jurisdictions.

In British Columbia, the Immigrant Employment Council of BC (IEC-BC) promotes the integration of skilled immigrant talent into BC's workforce. Since 2008, IEC-BC has been working closely with employers, business associations and other key stakeholders to improve hiring practices, encourage new public policies and programs, and change perceptions about immigrants in order to grow BC's economy through effective immigrant labour market integration. IEC-BC serves as an important voice for employers to enhance federal and provincial immigration policies governing foreign trained workers.

Skilled immigrants enter Canada and BC through various programs as administered by the Province in cooperation with Citizenship and Immigration Canada (CIC). The BC Provincial Nominee Program accelerates the permanent resident application process for skilled and/or experienced workers, experienced business persons and their family members who want to settle in BC permanently. It allows nominees to apply for permanent resident status through CIC under the fast-tracked Provincial Nominee stream – which can be faster than applying through other federal immigration streams. The program is administered on behalf of the Province of BC by the Ministry of Jobs, Tourism and Innovation in collaboration with Citizenship and Immigration Canada (CIC).

Changes to both the PNP and CIC's skilled worker programs are being implemented to facilitate the entry of skilled workers in strategic occupations to Canada and the provinces. CIC recently announced its intention to overhaul the National Economic Immigration intake and selection process through the implementation of an *Expression of Interest* model. The program change is expected to be implemented in the next 2-3 years and will create a pool of pre-screened applicants and may provide employers with a more direct role in the selection of newcomers.

Under the Federal Skilled Worker Program (FSWP), CIC announced proposed changes that would enable new Ministerial instructions and other pending regulatory changes to apply retroactively to existing applications for permanent residency. CIC is also pursuing changes to the FSWP Points Grid to favour the selection of younger skilled workers, proficient in English or French, who are better able to integrate into the Canadian labour market and who will be active members of the workforce for longer periods. CIC has also proposed a requirement that FSWP applicants must have their training credentials assessed and verified by a designated organization prior to their arrival in Canada. These changes are expected to be implemented in the fall, 2012.

CIC is also preparing to implement a new selection stream to facilitate the immigration of skilled tradespersons under the Federal Skilled Worker Program. The proposed enhancement would facilitate improved access to the FSWP for skilled tradespersons, who face barriers under the current

Points Grid allocation system (i.e., minimum point threshold required for years of training and education). This change would create an alternative pathway to facilitate the entry of skilled tradespersons once the credential assessment system is operational in fall, 2012.

SECTION 7: DEMAND-SUPPLY GAP ANALYSIS

The following gap analysis quantifies the difference between anticipated occupational demand (i.e., 2016 and 2020 job openings) and projected supply in select occupations. The analysis adopts two approaches for calculating labour supply through 2020:

1. BC Labour Market Scenario Model (BCLMSM) – This model provides supply (and demand) projections for individual occupations based on forecast economic and population data for British Columbia. The BCLMSM is a provincial forecasting model maintained by the Ministry of Jobs, Training and Innovation and updated annually. It includes projections for all occupations at the three-digit NOC level and four-digit level for larger occupations. For this analysis, supply projections are provided for the combined regional workforce (i.e., Lower Mainland and Vancouver Island/Coast) for each select occupation.

2. Sources of Industry Labour – This approach examines the various sources of labour to the Shipbuilding & Repair Industry, including graduates/completers of public post secondary education and training programs relevant to the industry, and other sources of labour to the industry including migrant workers from other parts of British Columbia (intraprovincial), other parts of Canada (interprovincial), and foreign trained workers (international). Supply projections for all migrant workers within the sector are based on their equivalent share of the workforce for each occupation as reported in the 2006 Census.

Occupational gaps are the difference between the demand for workers as identified by employers and the supply of workers as calculated through the two methods.

7.1 Gap Analysis – BC Labour Market Scenario Model

This model calculates occupational supply based on growth rates for select occupations within the shipbuilding and repair workforce. Projections are developed based on the total number of job openings in the industry for the years 2016 and 2020. As such, the projected supply of workers pertains specifically to the shipbuilding and repair workforce in the Lower Mainland and Vancouver Island/Coast, and not the broader provincial workforce. Based on the BCLMSM supply model, gaps are projected in all select occupations through 2020 (Table 25). Gaps are greatest in the traditional and marine trades, due to the large share of the industry workforce that these occupational categories represent.

Table 25: Demand-Supply Gap Analysis – BC Labour Market Scenario Model
British Columbia (2016-2020)

Select Occupation (Traditional Trades)	Workforce 2012	Demand-Supply Analysis	2012-2020	2012-2016	2017-2020
Supervisor, Trade & Related Workers	276	Demand (Openings)	135	77	58
		Projected Supply	14	32	-18
		Supply – Demand (Gap)	**(121)**	**(45)**	**(76)**
Machinist	86	Demand (Openings)	34	22	12
		Projected Supply	7	5	2
		Supply – Demand (Gap)	**(27)**	**(17)**	**(10)**
Pipefitters & Sprinkler Installers	164	Demand (Openings)	223	187	36
		Projected Supply	8	20	-12
		Supply – Demand (Gap)	**(215)**	**(167)**	**(48)**
Plumber	95	Demand (Openings)	55	38	17
		Projected Supply	4	11	-7
		Supply – Demand (Gap)	**(51)**	**(27)**	**(24)**
Electrician (Industrial)	130	Demand (Openings)	227	183	44
		Projected Supply	9	15	-6
		Supply – Demand (Gap)	**(218)**	**(168)**	**(50)**
Electrician (Construction)	149	Demand (Openings)	49	14	35
		Projected Supply	10	17	-7
		Supply – Demand (Gap)	**(39)**	**3**	**(42)**
Welder (A/B)	252	Demand (Openings)	451	289	162
		Projected Supply	18	21	-3
		Supply – Demand (Gap)	**(433)**	**(268)**	**(165)**
Painter	99	Demand (Openings)	66	43	23
		Projected Supply	3	13	-10
		Supply – Demand (Gap)	**(63)**	**(30)**	**(33)**
Millwright	39	Demand (Openings)	21	15	5
		Projected Supply	3	3	0
		Supply – Demand (Gap)	**(17)**	**(12)**	**(5)**
HD Mechanic	25	Demand (Openings)	31	21	10
		Projected Supply	2	2	0
		Supply – Demand (Gap)	**(29)**	**(19)**	**(10)**
Machine Fitter	165	Demand (Openings)	118	100	18
		Projected Supply	12	12	0
		Supply – Demand (Gap)	**(106)**	**(88)**	**(18)**

[Continued] **Table 25: Demand-Supply Gap Analysis – BC Labour Market Scenario Model**
British Columbia (2016-2020)

Select Occupation (Technical Occupations)	Workforce 2012	Demand-Supply Analysis	2012-2020	2012-2016	2017-2020
Mechanical Engineering (T&T)	62	Demand (Openings)	32	20	12
		Projected Supply	5	6	-1
		Supply – Demand (Gap)	**(27)**	**(14)**	**(13)**
Electrical/Electronic Engineering (T&T)	50	Demand (Openings)	28	19	9
		Projected Supply	4	3	1
		Supply – Demand (Gap)	**(24)**	**(16)**	**(8)**
Select Occupation (Production Management)	**Workforce 2012**	**Demand-Supply Analysis**	**2012-2020**	**2012-2016**	**2017-2020**
Manufacturing Manager	9	Demand (Openings)	8	4	4
		Projected Supply	1	1	0
		Supply – Demand (Gap)	**(7)**	**(3)**	**(4)**
Purchasing Manager	8	Demand (Openings)	7	4	3
		Projected Supply	0	0	0
		Supply – Demand (Gap)	**(7)**	**(4)**	**(3)**
Construction / Project Manager	40	Demand (Openings)	31	24	7
		Projected Supply	2	5	-3
		Supply – Demand (Gap)	**(29)**	**(19)**	**(10)**
Program Manager	8	Demand (Openings)	11	10	1
		Projected Supply	0	0	0
		Supply – Demand (Gap)	**(11)**	**(10)**	**(1)**
Procurement, Logistics & Material Management	90	Demand (Openings)	45	32	13
		Projected Supply	9	6	3
		Supply – Demand (Gap)	**(36)**	**(26)**	**(10)**
Job Estimating	20	Demand (Openings)	25	20	5
		Projected Supply	2	1	1
		Supply – Demand (Gap)	**(23)**	**(19)**	**(4)**
Quality Assurance	44	Demand (Openings)	33	22	11
		Projected Supply	5	3	2
		Supply – Demand (Gap)	**(27)**	**(18)**	**(9)**
Planning & Scheduling	41	Demand (Openings)	39	26	13
		Projected Supply	4	3	1
		Supply – Demand (Gap)	**(35)**	**(23)**	**(12)**
Planning & Scheduling	41	Demand (Openings)	39	26	13
		Projected Supply	4	3	1
		Supply – Demand (Gap)	**(35)**	**(23)**	**(12)**

[Continued] **Table 25: Demand-Supply Gap Analysis – BC Labour Market Scenario Model**
British Columbia (2016-2020)

Select Occupation (Marine Trades)	Workforce 2012	Demand-Supply Analysis	2012-2020	2012-2016	2017-2020
Marine Fitter	116	Demand (Openings)	293	188	105
		Projected Supply	8	8	0
		Supply – Demand (Gap)	**(285)**	**(180)**	**(105)**
Marine Engine Mechanic	72	Demand (Openings)	110	78	32
		Projected Supply	5	5	0
		Supply – Demand (Gap)	**(105)**	**(73)**	**(32)**
Shipwright	74	Demand (Openings)	56	35	21
		Projected Supply	3	10	-7
		Supply – Demand (Gap)	**(53)**	**(25)**	**(28)**
Sand Blaster	76	Demand (Openings)	88	53	35
		Projected Supply	2	10	-8
		Supply – Demand (Gap)	**(86)**	**(43)**	**(43)**

7.2 Gap Analysis – All Sources of Labour

Employers in the Shipbuilding & Repair industry rely on various sources of labour in addition to those trained and educated through public and private training programs. The following analysis estimates the projected supply of workers from the various sources of labour available to the sector, including graduates/completers of education and training programs and migrant workers from BC, Canada and internationally. The projected supply of migrant workers is based on the percentage of migrants who were employed in each select occupation according to the 2006 Census (i.e., migrated between 2001 and 2006). In this case, supply projections for 2012-2020 assume that the composition of the sector's migrant workforce has remained constant since 2006. Supply projections are then compared against the employment demand for each occupation (i.e., average annual job openings) to determine the projected gaps in labour through 2020.

The results of this analysis suggest that projected job openings in select occupations supported by a formal training or education program could be met through graduate outcomes. However, this result assumes that a high percentage of recent graduates (last 3 years) currently not working would make themselves available for employment in the Shipbuilding & Repair industry. As this is unlikely, the analysis overestimates the potential of unemployed graduates to assist in filling projected job openings. This notwithstanding, training programs associated with the skilled trades (i.e., apprenticeship) and other post secondary programs have demonstrated capacity to expand programming to help meet training requirements. Similarly, without an increased share of the industry workforce, migrant workers will not significantly assist in filling projected job openings in the industry. Targeted efforts would be needed to attract more migrant workers to the industry from other intraprovincial, interprovincial and international jurisdictions.

As other sources of labour are now less reliable, industry employers may feel compelled to train more apprentices to meet future requirements in the skilled trades. However, in other occupations,

including the marine trades and production management/critical function occupations where training programs are inadequate or non-existent, employers can either continue with current hiring practices or pursue the development of industry specific training programming to help meet future needs. For example, projected job openings in select marine trades could possibly be met through apprenticeship outcomes in related trades. Although a large number of marine trades workers are, in fact, trained in a related apprenticeship, this practice is still not widely embraced by employers as programs lack a marine focus. Industry has recently undertaken to develop the marine fitter trade program based on the related metal fabrication trade. Similar developments in other marine trades may be needed to help address future skills and training gaps.

Table 26: Demand-Supply Gap Analysis – All Labour Sources
2012 - 2020

Select Occupation (Traditional Trades)	Total Openings 2020 [Survey]	Projected Gap 2020 [BCLMSM]	Annual Avg (2012-20) [A]	Potential Training Outcomes [B]	Other BC [C]	Other Canada [D]	Other Int'l [E]	Surplus/ (Gap) [A-B-C-D-E]
Supervisor, Trade & Related Workers	135	(121)	(13)	8	2 (15%)	1 (5%)	0 (2%)	(2)
Machinist	34	(27)	(3)	10	1 (16%)	0 (2%)	0 (3%)	8
Pipefitter & Sprinkler Installer	223	(215)	(24)	2	4 (16%)	2 (8%)	0 (1%)	(16)
Plumber	55	(51)	(6)	25	1 (16%)	0 (1%)	0 (4%)	20
Electrician (Industrial)	227	(218)	(24)	4	3 (13%)	1 (4%)	0 (2%)	(16)
Electrician (Construction)	49	(39)	(4)	134	1 (18%)	0 (4%)	0 (3%)	131
Welder (A/B)	451	(433)	(48)	143	7 (15%)	2 (5%)	1 (2%)	105
Painter	66	(63)	(7)	--	1 (16%)	0 (6%)	0 (5%)	--
Millwright	21	(17)	(2)	15	0 (14%)	0 (3%)	0 (2%)	13
HD Mechanic	31	(29)	(3)	4	0 (15%)	0 (4%)	0 (1%)	1
Machine Fitter	118	(106)	(12)	14	2 (13%)	1 (9%)	0 (4%)	5
Select Occupation (Technicians & Technologists)	**Total Openings 2020 [Survey]**	**Projected Gap 2020 [BCLMSM]**	**Annual Avg (2012-20) [A]**	**Potential Training Outcomes [B]**	**Other BC [C]**	**Other Canada [D]**	**Other Int'l [E]**	**Surplus/ (Gap) [A-B-C-D-E]**
Mechanical Engineering (T&T)	32	(27)	(3)	4	1 (19%)	0 (3%)	0 (7%)	2
Electrical/Electronic Engineering (T&T)	28	(24)	(3)	4	1 (17%)	0 (5%)	0 (5%)	2

[Continued] **Table24: Demand-Supply Gap Analysis – All Labour Sources**
2012 - 2020

Select Occupation (Critical Function & Support)	Total Openings 2020 [Survey]	Projected Gap 2020 [BCLMSM]	Annual Avg (2012-20) [A]	Potential Training Outcomes [B]	Other BC [C]	Other Canada [D]	Other Int'l [E]	Surplus/ (Gap) [A-B-C-D-E]
Manufacturing Manager	8	(7)	(1)	1	0 (15%)	0 (4%)	0 (4%)	0
Purchasing Manager	7	(7)	(1)	1	0 (14%)	0 (4%)	0 (4%)	0
Construction / Project Manager	31	(29)	(3)	4	0 (15%)	0 (4%)	0 (3%)	1
Program Manager	11	(11)	(1)	1	0 (12%)	0 (5%)	0 (12%)	0
Procurement, Logistics & Material Management (Other Mgrs)	45	(36)	(4)	8	1 (15%)	0 (5%)	0 (5%)	5
Job Estimating (Construction Mgr)	25	(23)	(3)	5	0 (15%)	0 (5%)	0 (5%)	2
Quality Assurance (Construction Mgr)	33	(27)	(3)	6	0 (15%)	0 (5%)	0 (5%)	3
Planning & Scheduling (Construction Mgr)	39	(35)	(4)	7	1 (15%)	0 (5%)	0 (5%)	3
Select Occupation (Marine Trades)	**Total Openings 2020 [Survey]**	**Projected Gap 2020 [BCLMSM]**	**Annual Avg (2012-20) [A]**	**Potential Training Outcomes [B]**	**Other BC [C]**	**Other Canada [D]**	**Other Int'l [E]**	**Surplus/ (Gap) [A-B-C-D-E]**
Marine Fitter (Metal Fabricator)	293	(285)	(32)	37	5 (15%)	1 (4%)	1 (2%)	12
Marine Engine Mechanic (Mechanic)	110	(105)	(12)	14	2 (15%)	0 (4%)	0 (2%)	4
Shipwright (Carpenter)	56	(53)	(6)	7	1 (17%)	0 (6%)	0 (3%)	2
Sand Blaster (Painter)	88	(86)	(10)	--	2 (16%)	1 (6%)	0 (5%)	--

7.3 Summary

In relative terms, the Shipbuilding & Repair industry workforce is small with specific skill and training requirements. With the exception of apprenticeship training in support of the skilled trades, the industry has managed without the benefit of public training support in most other occupations, including marine trades, mid-management and critical function & support occupations. While several provincial education and training programs exist that could potentially help meet industry requirements, few are specific to the marine sector and rarely engaged by employers. Training gaps are a major risk to the industry going forward, particularly as it prepares to take on the challenge of constructing new vessels under the National Shipbuilding Procurement Strategy. Previous training practices where workers "piggy backed" on related training programs are no longer considered viable to meet the specific needs of the future workforce.

7.4 Risk Analysis

Competition for workers at all skill levels is increasing and the supply of younger workers is diminishing as the overall population ages. Employers are increasingly looking to other sources of labour to help meet future demand, including migrant workers from other parts of BC, Canada and internationally, while also increasing workforce participation rates among Aboriginal and other underrepresented workers. Compounding the challenge in meeting future requirements is the rapidly increasing level of planned investments in other industries that compete with BC shipyards for similar workers, including the construction, oil & gas, mining and related manufacturing sectors. Each of these sectors anticipates significant new investment over the next decade, which will serve to intensify the competition for talent among industries in BC and elsewhere.

The following examines current and proposed major projects in BC and Alberta that could impact the Shipbuilding & Repair industry's ability to access the necessary skills and training to meet future workforce requirements. Competition for talent and training opportunities from employers in other industries and jurisdictions is considered a major risk to the growth and development of BC's Shipbuilding & Repair industry.

7.4.1 Major Project Investments – BC and Alberta

BC maintains a Major Projects Inventory listing proposed, ongoing and recently completed major projects in each economic development region. All information is provided by proponents. As such, the level of detail, including capital investment and construction schedules varies considerably by project. Many projects included on the list are at an early stage of development and many may never come to fruition. In order to limit the inventory to those projects more likely to proceed, any project without an identified capital investment or construction schedule has been excluded from consideration. In addition, any projects listed as "On Hold" or "Completed" have also been removed from the list.

British Columbia

For illustrative purposes, direct employment impacts have been calculated for each major project to provide an indication of the employment demands associated with each project. Given the range of planned investments, the direct employment multiplier used for all projects is that associated with Other Engineering Construction (4.01), which would provide a conservative estimate of the total employment impacts. Based on planned investments of nearly $124 billion across BC, the total employment impact would be close to 500,000 person years of direct employment, or an average of 100,000 direct jobs each year over a five-year horizon. To put this in perspective, total employment in BC's construction industry in 2011 was 205,000 workers.

Table 27: Major Projects Overview –Direct Employment Impacts
British Columbia

Sector	Projects (#)	Value ($millions)	Direct Employment (Person Years of Employment)
Accommodation & Food Services	3	$586	2,350
Arts, Entertainment & Recreation	10	$842	3,376
Commercial	18	$1,092	4,379
Correctional Services	2	$278	1,115
Educational Services	46	$2,062	8,269
Health Care and Social Assistance	12	$2,688	10,779
Information Services/Residential	1	$20	80
Manufacturing	5	$3,606	14,460
Mining	28	$13,187	52,880
Oil & Gas Extraction	2	$3,800	15,238
Pipeline	5	$7,151	28,676
Port and Harbour Facilities	12	$4,053	16,253
Public Administration	8	$1,606	6,440
Research and Development	1	$80	321
Residential	163	$17,372	69,662
Residential/Commercial	39	$13,156	52,756
Residential/Educational Services	2	$1,020	4,090
Residential/Recreation/Commercial	1	$450	1,805
Residential/Resort	13	$4,315	17,303
Residential/Retail	6	$1,822	7,306
Residential/Retail/Commercial	4	$1,570	6,296
Resort	9	$5,042	20,218
Resort/Residential/Recreation	4	$1,376	5,518
Retail	14	$1,362	5,462
Retail/Commercial	3	$214	858
Retail/Recreation	1	$20	80
Seniors Housing	3	$80	321
Sewage Treatment Facilities	1	$86	345
Skiing Facilities	9	$3,985	15,980
Social Housing	4	$179	718
Transportation	13	$10,227	41,010
Utilities	56	$18,172	72,870
Warehousing	2	$66	265
Waste Treatment	1	$100	401
Water, Sewage and Other Systems	8	$1,947	7,807
Wood Products Manufacturing	1	$30	120
TOTAL	**510**	**$123,642**	**495,804**

Alberta

Alberta also maintains a Major Projects Inventory, which includes a higher proportion of currently underway and completed projects. It is assumed that those projects included on the Alberta list, while not always including a construction schedule, are likely to proceed to construction. Rather than an individual project-level analysis of all projects in Alberta, the approach taken in this analysis was to use the summary table showing the total value of all projects in each sector. Based on planned investments of close to $209 billion across the Province of Alberta, the total employment impact would be more than 837,000 person years of direct employment, or an average of 167,400 direct jobs each year over a five-year horizon.

Table 28: Major Projects Overview –Direct Employment Impacts
Alberta

Sector	Project Value ($ Millions)				Direct Employment (Person Years of Employment)
	Proposed & Underway	On Hold	Completed	Total Value	
Agriculture & Related	$201		$65	$266	1,065
Biofuels	$1,146	$210	$70	$1,426	5,717
Chemicals & Petrochemicals	$119			$119	475
Commercial/Retail	$6,962	$121	$562	$7,645	30,656
Commercial/Retail and Residential	$328	$1,216		$1,544	6,193
Forestry & Related	$241			$241	967
Infrastructure	$15,939	$200	$3,717	$19,856	79,623
Institutional	$8,189	$255	$116	$8,559	34,322
Mining	$760			$760	3,048
Oil & Gas	$2,397			$2,397	9,610
Oil Sands	$116,074	$15,330	$2,195	$133,599	535,732
Other Industrial	$1,515			$1,515	6,074
Pipelines	$6,297	$2,000		$8,297	33,272
Power	$13,294		$350	$13,644	54,713
Residential	$2,782	$1,831	$141	$4,754	19,062
Telecommunications	$6		$650	$656	2,631
Tourism/Recreation	$2,848	$70	$585	$3,503	14,045
TOTAL	**$179,096**	**$21,233**	**$8,450**	**$208,779**	**837,205**

7.4.2 Labour Market Analysis in High Demand Occupations – Washington State & Alberta

The ability of BC's Shipbuilding & Repair industry to attract and recruit skilled workers in the future will also be impacted by the demand for similar workers in other jurisdictions. Washington State's construction industry is projected to expand by 2% annually between 2014 and 2019, while the fabricated metal product manufacturing sector is projected to increase by 2.8% annually, significantly higher than the broader manufacturing industry. Projected growth rates in BC are lower for both the construction (0.2%) and metal fabrication and machinery (1.5%) sector[15]. Note that BC projections were developed prior to the announcement of several major projects in British Columbia, including the National Shipbuilding Procurement Strategy.

[15] COPS BC Unique Scenario 20070-2017

Table 29: Estimated Employment – Select Industries
Washington State

Industry	Est. Employment 2009	Est. Employment 2014	Est. Employment 2019	Avg. Annual Growth Rate 20014-2019
Construction	158,700	160,300	177,200	2.0%
Manufacturing	265,400	286,800	295,500	0.6%
Fabricated Metal Product Manufacturing	17,100	20,000	23,000	2.8%

Projected growth in Washington State's construction and manufacturing sectors over the next decade will result in increased demand for skilled workers in these industries. Many of the high demand occupations are similar to those identified in BC's Shipbuilding & Repair industry. Tabled below is a list of occupations considered "high demand" and their projected annual growth rates, and compared against growth rates of similar occupations in BC.

Table 30: Estimated Employment – Select Occupations
Washington State

Select Occupation	Est. Employment 2009	Est. Employment 2014	Est. Employment 2019	Avg. Annual Growth 2009-2014	Avg. Annual Growth 2014-2019	Average Growth Rates* 2012-2020
Industrial Production Managers	2,628	2,809	2,893	1.3%	0.6%	0.9%
Purchasing Managers	1,879	2,010	2,121	1.4%	1.1%	0.5%
Construction Managers	12,989	13,334	14,687	0.5%	2.0%	0.5%
Engineering Managers	5,842	6,227	6,608	1.3%	1.2%	1.2%
Business Operations Specialists	95,947	102,338	109,124	1.3%	1.3%	1.0%
Logisticians	5,452	5,773	6,002	1.2%	0.8%	1.0%
Marine Engineers and Naval Architects	621	654	703	1.0%	1.5%	--
Electrical and Electronic Engineering Technicians	2,796	3,056	3,326	1.8%	1.7%	1.0%
Mechanical Engineering Technicians	1,326	1,445	1,508	1.7%	0.9%	0.8%
Electricians	16,037	16,296	17,417	0.3%	1.3%	0.7%
Plumbers, Pipefitters, and Steamfitters	11,861	11,970	12,842	0.2%	1.4%	0.5%
Supervisors of Installation, Maintenance & Repair	9,673	10,067	10,456	0.8%	0.8%	0.6%
Industrial Machinery Mechanics	5,769	6,323	6,778	1.9%	1.4%	0.7%
Millwrights	1,389	1,513	1,514	1.7%	0.0%	0.7%
Structural Metal Fabricators and Fitters	2,083	2,338	2,615	2.3%	2.3%	0.8%
Machinists	5,338	5,966	6,361	2.2%	1.3%	0.9%
Welders, Cutters, Solderers, and Brazers	6,204	6,755	7,200	1.7%	1.3%	1.3%
Cabinetmakers and Bench Carpenters	3,171	3,256	3,397	0.5%	0.9%	0.5%
Painters, Transportation Equipment	1,591	1,601	1,601	0.1%	0.0%	0.4%

** Average growth rates for Lower Mainland and Vancouver Island/Coast*

As mentioned earlier, Alberta industry plans to invest close to $210 billion in the provincial economy in the coming years, most of which will be directed at the province's resource and construction sectors. Employment in the construction industry is expected to grow by 2.2% and generate an estimated 23,700 new jobs between 2011 and 2019[16]. Similarly employment in the province's mining and oil & gas sector is expected to grow on average 1.4% annually from 2010 to 2013. In 2010, Alberta's mining and oil & gas sector employed 140,200 workers, up from 76,500 in 2000, many of whom come to the industry from other industries and jurisdictions.

Employment in the province's manufacturing sector is also expected to increase by an average of 1.1% from 2010 to 2013. According to Alberta Occupational Demand Outlook 2011-2015, - employment growth in the following occupations is expected to exceed the 2.7% annual growth rate for all occupations – supervisors in assembly and fabrication; machine operators and related manufacturing workers; mechanical, electrical, electronics and other assemblers; and labourers in processing and manufacturing. Many of these "high demand" occupations are similar to those in BC's Shipbuilding & Repair industry.

[16] Construction Sector Council. Construction Looking Forward – An Assessment of Construction Labour Markets from 2011 to 2019 for Alberta.

SECTION 8: CONCLUSIONS & RECOMMENDATIONS

The National Shipbuilding Procurement Strategy (NSPS) presents the BC Shipbuilding & Repair industry with the opportunity to revitalize the shipbuilding industry on Canada's west coast. Based on the NSPS and related activities, BC's shipbuilding and repair industry could transform into a billion per year entity for public and commercial shipyards in BC. With a 30 year federal commitment, industry is now in a position to lay the foundation for the development of a long term human resource strategy that could propel the industry and its workforce for generations to come.

The introduction of the NSPS and the shift towards new vessel construction demands a workforce with skills sets and knowledge quite distinct from that required for maintaining and repairing vessels. Given industry's focus on these activities over the last decade and more, this has contributed to the development of a highly skilled workforce in these areas, while workers skilled in the construction of new vessels have had fewer opportunities to develop their skills or help mentor the next generation of shipbuilders. In this respect, traditional training practices are no longer sufficient to meet the demands of the future "shipbuilding" workforce. New training programs, sponsorship models, and innovative delivery – specific to the marine industry – will be required to ensure the next generation of shipbuilders is capable of serving the industry well beyond 2030.

The Shipbuilding & Repair industry is collectively facing the dual challenge of replacing an aging workforce and meeting future requirements driven by investment. The demand for skills and training has reached a critical point for the industry, as alternative sources, such as hiring from other companies and industries, is no longer considered a viable long term strategy. The shipbuilding and repair industry competes with several other industries for similar workers, including businesses that supply fabricated products to the industry. Competition for younger skilled workers is intense throughout the BC economy, highlighting the importance of recruiting, training and developing workers from within the industry. In light of these challenges, the Shipbuilding and Repair industry should emphasize the advantages of working in the industry, such as the potential for long-term employment in an industry which is expected to be somewhat insulated from the boom and bust cycle of competing industries.

In relative terms, the shipbuilding and repair industry workforce is small with specific skill and training requirements. With the exception of apprenticeship training in support of the skilled trades, the industry has managed without the benefit of public training support in most other occupations, including marine trades, mid-management and critical function and support. While several provincial education and training programs exist that could potentially help meet future requirements, few are specific to the marine sector and rarely engaged by employers. Training gaps are a major risk to the industry going forward, particularly as it prepares to take on the challenge of constructing new vessels under the National Shipbuilding Procurement Strategy.

Employers and stakeholders were consistent in their assessment of the need for specific marine training to meet current and future requirements. The demand for skills and training encompasses all aspects of the planning and production process, from entry-level to management. Increasing demand for production management, supervisory and marine trades training is particularly evident, as is the need to familiarize all new entrants on the operations of the shipbuilding and repair

environment. Investment in training and labour market development specific to the industry is no longer considered an option, but a requirement to grow and sustain the industry.

Towards 2030 – An Industry Workforce Strategy

Development of the future workforce strategy will be based, in part, on the outcomes of this project and related research currently underway in the industry. While oversight for the strategy would fall to industry, management and implementation would be the responsibility of another organization. At this time, the Industrial Marine Training & Applied Research Centre (IMTARC) would be a candidate to take on this responsibility. IMTARC has as its mission the task of "supporting the growth, productivity and competitiveness of the shipbuilding and repair sector by coordinating and facilitating workforce development and applied research."

Established by the BC Resource Training Organization with support from the federal government, IMTARC was created as a Centre of Excellence for:

- *Workforce Development* – to coordinate and implement labour market development strategies, for the purpose of developing a sustainable and productive workforce for the BC shipbuilding and repair industry;
- *Applied Research and Technology Transfer* – to support the transfer of new technologies and processes into BC's shipbuilding and repair industry, for the purpose of improving longer-term competitiveness and productivity; and
- *Coordination* – to serve as the linkage between industry, government, trainers and other partners, for the purpose of integrating productivity and workforce development strategies.

IMTARC's dual mandate encompassing workforce development and industry competitiveness positions the organization to coordinate and implement a long term workforce strategy for BC's Shipbuilding & Repair industry.

Recommendations

The following recommendations are put forward for consideration by the Table and include both a long term strategy to promote the development of a sustainable industry workforce and short term strategies to address specific occupational demands.

<u>Establish an Industry Governance Body to Oversee Training and Labour Market Development Activities for BC's Shipbuilding & Repair Industry (2012)</u>

- An Industry Governance Body (IGB) would be a standing committee, comprised of industry, government, labour and training representatives, responsible for guiding the development of all training and labour market initiatives on behalf of BC's Shipbuilding & Repair industry. This would include responsibility for developing a long term human resource strategy for the industry, focusing on attraction, recruitment and development of the future workforce, as

well as identification of roles and responsibilities amongst industry partners and timelines for implementation. Support for the IGB would come from industry, and federal and provincial government agencies responsible for human resource development.

- Implementation and coordination of the strategy would be the responsibility of an administrative organization (e.g., IMTARC), which would also serve as the industry's linkage to training providers at the secondary and post secondary level, labour partners, and public agencies responsible for education and training development, including the Resource Training Organization and the Industry Training Authority. All activities flowing from the strategy would be coordinated by the implementing organization.

Develop and Implement a Human Resource Strategy for BC's Shipbuilding & Repair Industry (2013)

The IGB would be responsible for the development and ongoing oversight of the industry strategy. Guiding principles for the development of the human resource strategy would include:

- *Industry Leadership* – industry is the lynchpin to ensuring that the labour market needs of shipyard operators and supporting supply chain businesses are fully identified and addressed going forward. Success of the NSPS (and related future developments) will in large measure depend on industry's ability to implement effective strategies that meet the needs of business and the communities in which they serve.

- *Industry Wide Participation* – the NSPS provides the opportunity to transform BC's Shipbuilding & Repair industry into a modern and competitive enterprise, capable of building vessels and providing services beyond the current environment. Engaging all levels of operations including small, medium and large shipyards and suppliers will ensure the development of a comprehensive strategy where all interests are represented.

- *Integrated Strategy* - while the NSPS represents the largest investment in BC's Shipbuilding & Repair industry, it is not the only source of business for the industry. Workforce development evolves from an industry business strategy that is focused on productivity and competitiveness. Future training and labour market development opportunities must be constructed within the industry's broader business strategy.

- *Community Involvement* – members of the local community are the single most important source of labour to the industry, and serve as a key basis of support for future developments. Workforce development opportunities that target local communities, including members from Aboriginal and immigrant populations, can help promote long term sustainability and stability for the industry.

- *Commitment to Training and Workforce Development* – the NSPS provides industry the opportunity to plan and develop the workforce force for the long term. Although near term pressures are significant, new training and labour market initiatives must be developed in the

context of industry's long term requirements. Once in place, it is industry's responsibility to support these programs and its participants in the long term.

Elements of the strategy would include:

- *Inform* – working with industry, education providers and community partners to inform and raise awareness of the benefits and career opportunities associated with BC's Shipbuilding & Repair industry;
- *Recruit* – focusing on local sources of new workers and experienced workers with skills and qualifications applicable to the industry, as well as migrants from other parts of BC, Canada and internationally to fill gaps in higher demand occupations;
- *Develop* – developing marine specific training and upgrading in support of entry-level, marine trades, production management and critical function occupations;
- *Retain* – company and industry initiatives that focus on promoting workers from within the industry, and other efforts to retain the existing workforce even during periods of slower economic activity.

Occupational Recommendations > Entry-Level Production

- Foundation programming and secondary school apprenticeships are available in most skilled trades relevant to the Shipbuilding & Repair industry. As a means of raising awareness and introducing new potential workers to the industry, incorporate workplace based training (e.g., internships) into foundation programming, while promoting the expansion of secondary school apprenticeships at the high school level. Develop a marine industry orientation program to familiarize potential recruits of the opportunities for training and development in shipbuilding.

Occupational Recommendations > Marine Trades

- Although there are no specific marine trades training programs at this time, each is closely related to one or more existing skilled trades programs. Efforts are currently underway to develop the marine fitter training program based on the existing metal fabrication apprenticeship program. Given projected demand for these skills from both the Shipbuilding & Repair industry and the Other Plate & Fabrication sector, training development and implementation should be expedited and possibly coordinated with this sector.
- Similar training developments are recommended for shipwrights and marine engine mechanics through the development of marine based modules in related training programs (i.e., joinery and millwright/HD mechanic) that prepare workers for employment in a shipyard.

Occupational Recommendations > Traditional Trades

- Expand the scope of training for traditional trades to include a marine option (i.e., endorsement) for work in a shipyard. Develop this training option for the dual purpose of facilitating the recruitment of skilled workers with experience in other industries and jurisdictions.

- Develop formal upgrading programs to provide experienced trades workers with skills and knowledge to effectively transition into leadership roles, including supervisory and operations management. Examine the existing program model as developed for the building construction industry as provided through BCIT, in conjunction with that offered by the Fisheries & Marine Institute out of Newfoundland's Memorial University.

Occupational Recommendations > Professional Engineers, Technologist & Technicians

- Examine the potential for partnering with other Canadian training institutions for the provision of naval architecture, design services and knowledge transfer on an as-needed basis. Explore the potential for co-op or work placement opportunities for students in existing Canadian programs, such as Newfoundland's Memorial University (Fisheries & Marine Institute).

- Approach Applied Technicians & Technologists Association of BC (ASTTBC) as to their interest in helping develop a marine option for existing mechanical and electrical technologist and technician programs at BCIT and Camosun. Strengthen relationships with training providers to help promote career opportunities in the Shipbuilding & Repair industry for graduates of these programs.

- Approach the BC government to provide base funding for the development of marine options for existing programs.

Occupational Recommendations > Production Management / Critical Function & Support Specialists

- Pursue the development of targeted production management training programs with public and private training providers specific to the marine industry, encompassing critical functions such as planning, job estimating, purchasing, logistics and materials management. Examine similar programs currently offered at BCIT (e.g., operations management and supervision) and Memorial University for application in the BC Shipbuilding & Repair industry.

- Approach professional organizations, such as the Project Management Institute (PMI) and the Institute for Certification in Production and Inventory Management (CPIM), for development and certification purposes.

Appendix A – BC Shipbuilding & Repair Industry Workforce Table

Name	Organization
Barker, Malcolm	Seaspan Victoria Shipyards
Baskerville, Shannon	Ministry of Jobs, Tourism & Innovation
Bekkering, Hank	Point Hope Maritime
Briggs, John	Western Economic Diversification Canada
Dangerfield, Paul	BC Institute of Technology
Collins, Mark	BC Ferries
Fitzpatrick, Jim	Boilermakers Union Local 191
Hansen, Darryl	Babcock Canada
Hodgson, Colleen	Metis Skills and Education Centre, Director of Education
Louise Anne Granger	Canadian Coast Guard (Pacific Region)
Jothen, Kerry	Table Working Group
Lewis, Ian	Seaspan Shipyards
Lust, Matthew	Construction & Specialized Workers' Union Local 611
Macintosh, Richard	Boilermakers Union
MacLaren, Doug	Resource Training Organization
MacPherson, George	Marine Workers Union
McLaren, Malcolm	Allied Shipbuilders
Milne, Jim	Esquimalt Graving Dock, Public Works & Government Services Canada
Minty, Dawn	Ministry of Advanced Education
Ng, Keok	Deas Pacific Marine, BC Ferries
Okabe, Allan	Ganhada Management Group
Rumpel, Steven	Colleges & Skills Development Branch, Ministry of Advanced Education
Roemer, Tom	Camosun College
Rogers, Des	Federal Government Dockyards, Trades Labour Council
Rueben, Capt. (N) Alex	Resource Training Organization
Schulz, Tammy	Western Economic Diversification Canada
Sehn, Eric	School of Trades & Technology, Camosun College
Shaw, John	Seaspan Shipyards
Smith, Capt. (N) Don	FMF Cape Breton, RCN
Smith, John	FMFCape Breton, National Defence
Scales, Rob	Industry Training Authority
Stevens, Geoff	IMTARC
van Wachem, Ron	The Nanaimo Shipyard Group
Westran, Joan	Ministry of Jobs, Tourism & Innovation
Wright, Don	BCIT/Trades Training Consortium

Appendix B – Detailed Investment Overview by Organization

Seaspan (Victoria Shipyards)												
Type	***Project***	***Client***	***Timeframe***	***2011***	***2012***	***2013***	***2014***	***2015***	***2016***	***2017***	***2018***	***2019***	***2020***
Refit	FELEX	RCN	2008-13	$50.0	$50.0	$50.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
M&R	FELEX	RCN	2014-20	$0.0	$0.0	$0.0	$3.0	$3.0	$3.0	$3.0	$3.0	$3.0	$3.0
M&R	-	Private	2011-20	$43.6	$92.3	$68.1	$76.4	$76.4	$30.6	$30.6	$30.6	$30.6	$30.6
ISS	FELEX (CSI)	RCN	2010-17	$0.0	$0.0	$0.0	$14.7	$14.7	$14.7	$14.7	$14.7	$14.7	$14.7
ISS	VISSC	RCN	2008-23	$20.0	$20.0	$20.0	$20.0	$20.0	$20.0	$20.0	$20.0	$20.0	$20.0
New Build	NSPS	CCG	2013-14	$0.0	$0.0	$24.2	$24.2	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
New Build	NSPS	CCG	2014-15	$0.0	$0.0	$0.0	$28.5	$28.5	$0.0	$0.0	$0.0	$0.0	$0.0
New Build	NSPS	CCG	2014-19	$0.0	$0.0	$0.0	$46.7	$46.7	$46.7	$46.7	$46.7	$46.7	$0.0
New Build	NSPS	CCG	2013-24	$0.0	$0.0	$110.8	$110.8	$110.8	$110.8	$110.8	$110.8	$110.8	$110.8
Totals				**$113.6**	**$162.3**	**$273.1**	**$324.3**	**$300.1**	**$225.8**	**$225.8**	**$225.8**	**$225.8**	**$179.1**

Seaspan (Vancouver Shipyards)												
Type	***Project***	***Client***	***Timeframe***	***2011***	***2012***	***2013***	***2014***	***2015***	***2016***	***2017***	***2018***	***2019***	***2020***
M&R/Refit	-	Private	2011-20	$55.2	$59.8	$15.2	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
New Build	NSPS	CCG	2013-14	$0.0	$0.0	$47.1	$47.1	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
New Build	NSPS	CCG	2014-15	$0.0	$0.0	$0.0	$79.3	$79.3	$0.0	$0.0	$0.0	$0.0	$0.0
New Build	NSPS	CCG	2014-19	$0.0	$0.0	$0.0	$86.7	$86.7	$86.7	$86.7	$86.7	$86.7	$0.0
New Build	NSPS	RCN	2014-19	$0.0	$0.0	$0.0	$141.2	$188.3	$503.6	$589.0	$589.0	$589.0	$0.0
New Build	NSPS	CCG	2013-24	$0.0	$0.0	$205.8	$205.8	$205.8	$205.8	$205.8	$205.8	$205.8	$205.8
New Build	All	Private	2011-12	$5.0	$5.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Totals				**$60.2**	**$64.8**	**$268.1**	**$560.1**	**$560.1**	**$796.1**	**$881.5**	**$881.5**	**$881.5**	**$205.8**

Other Commercial Shipyards (25%)												
Type	***Project***	***Client***	***Timeframe***	***2011***	***2012***	***2013***	***2014***	***2015***	***2016***	***2017***	***2018***	***2019***	***2020***
M&R/Refit	-	Private	2011-20	$48.6	$62.6	$45.0	$34.7	$34.4	$23.1	$22.9	$23.6	$23.6	$23.6

Department of National Defence (FMF Cape Breton)											
Type	***Project***	***Client***	***Timeframe***	***2011***	***2012***	***2013***	***2014***	***2015***	***2016***	***2017***	***2018***	***2019***	***2020***
Refit	Fleet	RCN	2011-20	$4.0	$4.0	$4.0	$4.0	$4.0	$4.0	$4.0	$4.0	$4.0	$4.0
M&R	Fleet	RCN	2011-20	$78.4	$73.4	$73.4	$68.4	$68.4	$68.4	$68.4	$68.4	$68.4	$68.4
ISS	VISSC	RCN	2008-17	$10.0	$10.0	$10.0	$10.0	$10.0	$10.0	$10.0	$10.0	$10.0	$10.0
ISS	Aux. Vessels	RCN	2011-14	$10.0	$10.0	$10.0	$10.0	$10.0	$10.0	$10.0	$10.0	$0.0	$0.0
Totals				**$102.4**	**$97.4**	**$97.4**	**$92.4**	**$92.4**	**$92.4**	**$92.4**	**$92.4**	**$82.4**	**$82.4**

Canadian Coast Guard											
Type	***Project***	***Client***	***Timeframe***	***2011***	***2012***	***2013***	***2014***	***2015***	***2016***	***2017***	***2018***	***2019***	***2020***
M&R	Fleet	CCG	2011-20	$6.1	$6.0	$6.0	$6.0	$6.0	$6.0	$6.0	$6.0	$6.0	$6.0
ISS	Fleet	CCG	2011-20	$2.5	$2.0	$2.0	$2.0	$2.0	$2.0	$2.0	$2.0	$2.0	$2.0
Totals							**$8.6**	**$8.0**	**$8.0**	**$8.0**	**$8.0**	**$8.0**	**$8.0**

BC Ferries											
Type	***Project***	***Client***	***Timeframe***	***2011***	***2012***	***2013***	***2014***	***2015***	***2016***	***2017***	***2018***	***2019***	***2020***
Refit	Fleet	BCF	2011-20	$25.0	$41.0	$50.0	$35.0	$42.0	$39.0	$45.0	$42.0	$42.0	$42.0
M&R	Fleet	BCF	2011-20	$25.0	$41.0	$50.0	$35.0	$42.0	$39.0	$45.0	$42.0	$42.0	$42.0
New Build	Replacement	BCF	2017-20	-	-	-	-	-	-	$77.0	$119.0	$98.0	$154.0
Totals				**$100.0**	**$66.0**	**$74.0**	**$59.0**	**$65.0**	**$62.0**	**$142.0**	**$183.0**	**$162.0**	**$218.0**

Appendix C – Baseline Employment (All Occupations)

	Reported – 2012					Adjusted - 2012	
SRI Occupation	**Current**	**Vacant**	**%**	**Total**	**%**	**Current**	**%**
Senior/General Manager	19	-	0.0%	19	0.7%	21	0.6%
Financial (Risk) Manager	8	-	0.0%	8	0.3%	9	0.3%
Purchasing/Supply Chain Manager	7	-	0.0%	7	0.2%	8	0.2%
Human Resource Manager	3	-	0.0%	3	0.1%	3	0.1%
Management (Non-Production)	**37**	**-**	**0.0%**	**37**	**1.3%**	**41**	**1.3%**
Engineering Manager	3	-	0.0%	3	0.1%	3	0.1%
Manufacturing/Operations Manager	8	-	0.0%	8	0.3%	9	0.3%
Construction/Project Manager	35	1	2.9%	36	1.2%	40	1.2%
Facility/Maintenance Manager	6	-	0.0%	6	0.2%	7	0.2%
Program Manager (Material Requirements Planning)	7	-	0.0%	7	0.2%	8	0.2%
Management (Production)	**59**	**1**	**1.7%**	**60**	**2.1%**	**66**	**2.1%**
Quality Assurance/Quality Control	39	1	2.6%	40	1.4%	44	1.4%
Job Estimating	17	1	5.8%	18	0.6%	20	0.6%
Planning & Scheduling	36	1	2.8%	37	1.3%	41	1.3%
Procurement, Logistics & Material Management	80	2	2.5%	82	2.8%	90	2.8%
Critical Function & Support	**173**	**5**	**2.9%**	**178**	**6.1%**	**195**	**6.1%**
Engineering – Mechanical	5	-	0.0%	5	0.2%	6	0.2%
Engineering – Electrical	7	1	14.3%	8	0.3%	9	0.3%
Industrial & Process Engineering – Production/Plant	2	-	0.0%	2	0.1%	2	0.1%
Engineering/Architecture – Marine	8	1	12.5%	9	0.3%	10	0.3%
Professional Engineer	**22**	**2**	**9.1%**	**24**	**0.8%**	**26**	**0.8%**
Mechanical / Marine Engineering	47	9	19.1%	56	1.9%	62	1.9%
Electrical / Electronics Engineering	35	10	28.6%	45	1.5%	50	1.5%
Instrumentation & Control	25	5	20.0%	30	1.0%	33	1.0%
Industrial Engineering	3	-	0.0%	3	0.1%	3	0.1%
Communications	7	3	42.9%	10	0.3%	11	0.3%
Architectural	2	2	100.0%	4	0.1%	4	0.1%
Construction Estimator	-	-	-	-	0.0%	-	0.0%
Technicians & Technologists	**119**	**29**	**24.4%**	**148**	**5.1%**	**163**	**5.1%**
Comptroller and Finance	16	2	12.5%	18	0.6%	20	0.6%
Information Technology	12	6	50.0%	18	0.6%	20	0.6%
Configuration and Data Management	7	2	28.6%	9	0.3%	10	0.3%
Environmental Assurance and Assessment	5	-	0.0%	5	0.2%	6	0.2%
Occupational Health and Safety	29	1	3.4%	30	1.0%	33	1.0%
Facilities Maintenance and Cleaning Services	10	-	0.0%	10	0.3%	11	0.3%
Program Office Work	60	6	10.0%	66	2.3%	73	2.3%
Admin & Support	**139**	**17**	**12.2%**	**156**	**5.4%**	**172**	**5.3%**
Supervisor, Trade & Related Workers	251	-	0.0%	251	8.6%	276	8.6%
Machinist	78	-	0.0%	78	2.7%	86	2.7%
Tool & Die Maker	3	-	0.0%	3	0.1%	3	0.1%
Plumber	86	-	0.0%	86	3.0%	95	2.9%
Steamfitters, Pipefitters & Sprinkler Installers	149	-	0.0%	149	5.1%	164	5.1%
Construction Electrician	135	-	0.0%	135	4.6%	149	4.6%
Industrial Electrician	118	-	0.0%	118	4.1%	130	4.0%
Winder Electrician	-	-	-	-	0.0%	-	0.0%
Cable Splicer	-	-	-	-	0.0%	-	0.0%
Sheet Metal Worker	64	-	0.0%	64	2.2%	70	2.2%
Boilermaker	43	-	0.0%	43	1.5%	47	1.5%
Structural Metal & Platework Fabricators and Fitter	27	-	0.0%	27	0.9%	30	0.9%

	Reported – 2012					Adjusted - 2012	
SRI Occupation	**Current**	**Vacant**	**%**	**Total**	**%**	**Current**	**%**
Ironworker	63	-	0.0%	63	2.2%	69	2.2%
Welders – Level C	8	-	0.0%	8	0.3%	9	0.3%
Welders – Level A/B	79	-	0.0%	79	2.7%	87	2.7%
Welders - CWB	150	-	0.0%	150	5.2%	165	5.1%
Carpenter	9	-	0.0%	9	0.3%	10	0.3%
Painter	90	-	0.0%	90	3.1%	99	3.1%
Electroplater	9	-	0.0%	9	0.3%	10	0.3%
Millwright /Industrial Mechanic	35	-	0.0%	35	1.2%	39	1.2%
Heavy-Duty Equipment Mechanic	23	-	0.0%	23	0.8%	25	0.8%
Hydraulic Service Mechanic	6	-	0.0%	6	0.2%	7	0.2%
Refrigeration & Air Conditioning Mechanic	16	2	12.5%	18	0.6%	20	0.6%
Machine Fitter	150	-	0.0%	150	5.2%	165	5.1%
Tower/Mobile Crane Operator	18	2	11.1%	20	0.7%	22	0.7%
Trades Helpers & Labourers	281	-	0.0%	281	9.7%	309	9.6%
Trades	**1,891**	**4**	**0.2%**	**1,895**	**65.2%**	**2,085**	**64.8%**
Marine Fitter	97	8	8.2%	105	3.6%	116	3.6%
Marine Engine Mechanic	59	6	10.2%	65	2.2%	72	2.2%
Shipwright / Joiner	65	2	3.1%	67	2.3%	74	2.3%
Rigger	71	-	0.0%	71	2.4%	78	2.4%
Dock Master	8	2	25.0%	10	0.3%	11	0.3%
Sand Blaster	63	6	9.5%	69	2.4%	76	2.4%
Sprayer	17	4	23.5%	21	0.7%	23	0.7%
Marine Trades	**380**	**28**	**7.4%**	**408**	**14.0%**	**449**	**13.9%**
Totals	**2,820**	**86**	**3.1%**	**2,906**	**100%**	**3,198**	**100%**

Appendix D – Projected Job Openings (All Occupations)

	Baseline	Projected 2012-2016			Projected 2012-2020		
SRI Occupation	2012	Retirees	Growth	Total Openings	Retirees	Growth	Total Openings
Senior/General Manager	21	7	3	10	13	5	18
Financial (Risk) Manager	9	4	1	5	6	1	7
Purchasing/Supply Chain Manager	8	1	3	4	2	5	7
Human Resource Manager	3	-	-	-	1	1	2
Management (Non-Production)	**41**	**12**	**7**	**19**	**22**	**12**	**34**
Engineering Manager	3	-	4	4	1	4	5
Manufacturing/Operations Manager	9	1	3	4	4	4	8
Construction/Project Manager	40	5	19	24	11	20	31
Facility/Maintenance Manager	7	1	3	4	1	3	4
Program Manager (Material Requirements Planning)	8	-	10	10	1	10	11
Management (Production)	**66**	7	39	46	18	41	59
Quality Assurance/Quality Control	44	14	8	22	23	10	33
Job Estimating	20	5	15	20	8	17	25
Planning & Scheduling	41	14	12	26	25	14	39
Procurement, Logistics & Material Management	90	16	16	32	27	18	45
Critical Function & Support	**195**	**49**	**51**	**100**	**83**	**59**	**142**
Engineering – Mechanical	6	1	2	3	2	2	4
Engineering – Electrical	9	2	-	2	4	-	4
Industrial & Process Engineering – Production/Plant	2	2	1	3	2	1	3
Engineering/Architecture – Marine	10	-	3	3	2	4	6
Professional Engineer	**26**	**5**	**6**	**11**	**10**	**7**	**17**
Mechanical / Marine Engineering	62	15	5	20	26	6	32
Electrical / Electronics Engineering	50	16	3	19	24	4	28
Instrumentation & Control	33	2	1	3	9	1	10
Industrial Engineering	3	-	-	-	-	-	-
Communications	11	2	-	2	5	-	5
Architectural	4	-	2	2	-	2	2
Construction Estimator	-	-	-	-	-	-	-
Technicians & Technologists	**163**	**35**	**11**	**46**	**64**	**13**	**77**
Comptroller and Finance	20	2	5	7	7	7	14
Information Technology	20	1	3	4	3	3	6
Configuration and Data Management	10	1	4	5	2	4	6
Environmental Assurance and Assessment	6	-	3	3	2	3	5
Occupational Health and Safety	33	3	9	12	7	10	17
Facilities Maintenance and Cleaning Services	11	2	2	4	5	2	7
Program Office Work	73	13	21	34	19	21	40
Admin & Support	**172**	**22**	**47**	**69**	**45**	**50**	**95**
Supervisor, Trade & Related Workers	276	24	53	77	68	67	135
Machinist	86	9	13	22	19	15	34
Tool & Die Maker	3	1	-	1	1	-	1
Plumber	95	4	34	38	14	41	55
Steamfitters, Pipefitters & Sprinkler Installers	164	19	168	187	32	191	223
Construction Electrician	149	6	8	14	10	39	49
Industrial Electrician	130	26	157	183	47	180	227
Winder Electrician	-	-	-	-	-	-	-
Cable Splicer	-	-	-	-	-	-	-
Sheet Metal Worker	70	7	8	15	18	8	26
Boilermaker	47	7	-	7	12	-	12
Structural Metal & Platework Fabricators and Fitter	30	4	8	12	8	14	22

SRI Occupation	Baseline 2012	Projected 2012-2016 Retirees	Growth	Total Openings	Projected 2012-2020 Retirees	Growth	Total Openings
Ironworker	69	5	10	15	12	10	22
Welders – Level C	9	-	4	4	-	12	12
Welders – Level A/B	87	14	22	36	26	30	56
Welders - CWB	165	18	235	253	38	357	395
Carpenter	10	2	20	22	2	39	41
Painter	99	12	31	43	24	42	66
Electroplater	10	2	-	2	3	-	3
Millwright /Industrial Mechanic	39	7	8	15	10	11	21
Heavy-Duty Equipment Mechanic	25	4	17	21	10	21	31
Hydraulic Service Mechanic	7	1	-	1	2	-	2
Refrigeration & Air Conditioning Mechanic	20	4	-	4	5	-	5
Machine Fitter	165	16	84	100	34	84	118
Tower/Mobile Crane Operator	22	2	2	4	4	5	9
Trades Helpers & Labourers	309	22	130	152	54	140	194
Trades	**2,085**	**216**	**1,012**	**1,228**	**453**	**1,306**	**1,759**
Marine Fitter	116	13	175	188	29	264	293
Marine Engine Mechanic	72	13	65	78	28	82	110
Shipwright / Joiner	74	19	16	35	30	26	56
Rigger	78	14	16	30	26	43	69
Dock Master	11	2	4	6	2	7	9
Sand Blaster	76	10	43	53	28	60	88
Sprayer	23	5	12	17	9	22	31
Marine Trades	**449**	**76**	**331**	**407**	**152**	**504**	**656**
Totals	**3,198**	**422**	**1,504**	**1,926**	**846**	**1,992**	**2,838**

Appendix E – Inventory of Select Training Programs (BC & Canada)

Training Discipline	Institution	Program	Certificate
Project Management & Leadership Development	BC Institute of Technology	Construction Management	Degree
		Construction Supervision, Construction Operations	Certificate
	Memorial University of Newfoundland, Marine Institute	Quality/Project Management	Certificate (Post Graduate)
Technical & Technology	BC Institute of Technology North Island College	Marine Engineering	Diploma
	Georgian College	Marine Engineering Technology (Co-op)	Diploma
	Memorial University of Newfoundland, Marine Institute	Marine Engineering Systems Design Technology	Technologist
		Marine Engineering Technician	Technician
		Marine Engineering Technology	Technologist
		Naval Architecture Technology	Technologist
	Institut maritime du Québec	Naval Architecture & Marine Engineering	Diploma
Engineering	Memorial University of Newfoundland, Faculty of Engineering and Applied Science	Ocean & Naval Architectural Engineering	Degree
	Dalhousie University, Faculty of Architecture and Planning	Naval Architecture & Marine Engineering	Post Graduate (Mechanical)

Appendix F – Aboriginal & Immigrant Populations (Vancouver & Victoria)

Aboriginal and immigrant workers potentially represent an important source of labour for meeting future workforce requirements. Tabled below are labour force profiles of both Aboriginal and immigrant communities in Greater Vancouver and Greater Victoria based on 2006 Census. As detailed in Table 1, labour force participation is generally lower among immigrants aged 15 years and older (62%), whereas unemployment is higher among Aboriginal workers (11% vs. 6%). A larger proportion of Aboriginals (19%) were employed in industries relevant to shipbuilding and repair (i.e., construction and manufacturing), though 9% of the immigrant labour force was employed in professional and technical service industries, which also has application in shipbuilding and repair (note: similar data not available for Aboriginal labour force). A relatively high percentage (31%) of Aboriginal workers were employed in high demand occupations in shipbuilding and repair, including 20% in trades, transport and equipment occupations. While more Aboriginal workers possessed an apprenticeship or trades certificate (14% vs. 8%), a higher overall proportion of immigrants possessed post secondary credentials (50% vs. 30%).

Labour Force Profile – Vancouver CMA (2006)

		Vancouver (CMA)			
	Demographic	Aboriginal Profile		Immigrant Profile	
Population	Age (15+)	30,465		787,380	
Labour Force	Total	20,500	-	489,610	-
	Employed	18,305	89%	458,700	94%
	Unemployed	2,195	11%	30,910	6%
	Not in labour force	9,960	33%	297,770	38%
Employment (Select Industry)	Total	19,860	-	478,760	-
	Construction	2,275	11%	26,285	5%
	Manufacturing	1,610	8%	50,580	11%
	Professional, scientific and technical services	-	-	44,170	9%
	Other	15,975	80%	357,725	75%
Occupational Category (Select)	Total	19,860	-	478,760	-
	Natural and applied sciences	795	4%	39,800	8%
	Trades, transport and equipment operators	3,970	20%	57,360	12%
	Occupations unique to primary industry	500	3%	9,505	2%
	Occupations unique to processing, mfg & utilities	785	4%	29,490	6%
	Other	13,810	70%	353,455	74%
Education Attainment	Total	30,460	-	787,380	-
	No certificate, diploma or degree	8,990	30%	147,070	19%
	High school certificate or equivalent	8,255	27%	189,430	24%
	Apprenticeship or trades certificate or diploma	4,150	14%	59,965	8%
	College or other non-university	5,300	17%	108,510	14%
	University certificate or diploma below bachelor level	1,120	4%	63,405	8%
	University certificate, diploma or degree at bachelor's level or above	2,645	9%	219,000	28%

Labour Force Profile – Victoria CMA (2006)

		Victoria (CMA)			
	Demographic	**Aboriginal Profile**		**Immigrant Profile**	
Population	Age (15+)	8,090		60,125	
Labour Force	Total	5,560	-	33,015	-
	Employed	5,070	91%	31,790	96%
	Unemployed	490	9%	1,230	4%
	Not in labour force	2,525	31%	27,110	45%
Employment (Select Industry)	Total	5,460	-	33,015	-
	Construction	485	9%	1,745	5%
	Manufacturing	230	4%	1,290	4%
	Professional, scientific and technical services	-	-	3,170	10%
	Other	4,745	87%	26,810	81%
Occupational Category (Select)	Total	5,465	-	33,015	-
	Natural and applied sciences	205	4%	2,875	9%
	Trades, transport and equipment operators	850	16%	3185	10%
	Occupations unique to primary industry	180	3%	725	2%
	Occupations unique to processing, mfg & utilities	165	3%	485	1%
	Other	4,065	74%	25,745	78%
Education Attainment	Total	8,090	-	60,125	-
	No certificate, diploma or degree	2,580	32%	8,045	13%
	High school certificate or equivalent	2,075	26%	13,715	23%
	Apprenticeship or trades certificate or diploma	900	11%	6,655	11%
	College or other non-university	1,375	17%	10,520	17%
	University certificate or diploma below bachelor level	340	4%	4,145	7%
	University certificate, diploma or degree at bachelor's level or above	815	10%	17,050	28%