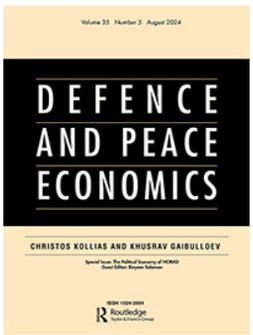

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The Economic Benefits of North Warning System Modernization

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ABSTRACT

This study examines the economic impacts of the North Warning System (NWS) modernization. It begins by first providing a summary of the creation and evolution of the North American Aerospace and Defense Command (NORAD) and the NWS with a specific intention of setting the stage for the discussion on subsequent areas. Understanding how NORAD and the NWS developed to where it is today is important to understand the choices available to the Canadian government moving forward. Next, the current security environment in Canada's North will be reviewed. The impact of climate change and global warming, new technology, and new threats changes the strategic environment in the North and Canada needs to revisit how it approaches these challenges. Based on this review of the security environment, the literature on socioeconomic studies, electoral districts and defence spending in the North can be presented along with the empirical data that exists from past studies. The study looks at five scenarios taking a rough order of magnitude look at possible economic benefits to Canada's three northern territories and Labrador based on the requirement for modernizing the NWS, a critical issue for the future defence of Canada and North America.

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Introduction

The most recent Canadian Defence Policy, *Strong Secure Engaged* (SSE) was released in June of 2017 after considerable consultation by the government with Canadians. The defence policy articulated the priorities for government and identified the funding levels that would be required for the variety of initiatives identified in the policy. One issue identified but not funded was the requirement to modernize the NWS. In the summary of initiatives NORAD modernization is listed as initiative 111 and more specifically for the NWS the Policy indicates 'To this end, Canada and the United States have already launched bilateral collaboration to seek an innovative technological solution to continental defence challenges including early warning. Studies are ongoing to determine how best to replace this important capability as part of the overall NORAD modernization' (Department of National Defence DND 2017, 79).

Since the release of *Strong Secure Engaged*, discussions on this particular issue have continued and a number of people have commented on the issue. In a 23 February 2021 meeting Prime Minster Trudeau and President Biden committed to modernizing NORAD (Prime Minister's Office Statement) and the April 2021 Federal Budget indicated the government's plan to spend $163 M[1] over 5 years beginning in Fiscal Year 2021-22 to support NORAD modernization (Finance 2021, 289). In January of 2022 the government awarded a $592 M contract to the Nasittuq Corporation for the operation and maintenance of the existing NWS (DND 2022b). The contract has an option for renewal for two additional 4-year periods bringing the entire length of the contract to 15 years with a possible investment of $1.3B.

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This study examines the local industrial and regional economic impacts of NORAD modernization. The initial intention was to provide a combination of theoretical and empirical analysis and utilize data from Socioeconomic studies, DND estimated expenditures by electoral district, Departmental Results Reports and the government's Public Accounts. Having concluded an examination of the available data, this will be less than satisfactory for those hoping for site-specific impacts. There is just not enough data for this level of detail. There are, however, some broader conclusions that can be drawn from available data, but it is important to note that the overall impact will depend on policy decisions that still need to be made by the Canadian government.

The study begins by first providing a summary of the creation and evolution of NORAD and the NWS with a specific intention of setting the stage for the discussion on subsequent areas. Understanding how NORAD and the NWS developed to where it is today is important to understand the choices available to the Canadian government moving forward. Next, the current security environment in Canada's North will be reviewed. The impact of climate change and global warming, new technology, and new threats changes the strategic environment in the North and Canada needs to revisit how it approaches these challenges. The replacement of the NWS needs to be considered as part of this broader examination. Based on this review of the security environment the literature on socioeconomic studies, electoral districts and defence spending in the North can be presented along with the empirical data that exists from past studies.

NORAD and the North Warning System

NORAD was established in May 1958 as a bi-national military organization between Canada and the United States. Born out of the Cold War and the security environment of the early 1950s, the creation of NORAD allowed the territory of Canada and the United States to be "considered as a single territory to be defended against bomber attack . . . (Nossal 2020, 15). More importantly it 'institutionalized a means for Canada to contribute to the formation of continental defence and thus helped to legitimize full participation in a fundamentally unequal relationship' (Nossal 2020, 15-16).

Lawson and Sawler note that at the time of NORAD's creation the 'Soviet Union was making rapid advancements in both Long-Range Bomber Aviation (LRA) and nuclear weaponry' (Lawson and Sawler 2012, 6). This was a recognized danger to both Canada and the US. Since its creation, NORAD has monitored the air and later the aerospace of Canadian and American arctic territory. Charron notes in a footnote in her book Chapter 'North American Aerospace Defense Command and the Arctic: Beyond the Santa Tracker' that the agreement had been revised nine times since its original 12 May 1958 signing and on the tenth revision in 2006 the agreement was signed in perpetuity (Charron 2016, 84). The 2006 agreement indicated 'the primary missions of NORAD in the future shall be to provide: Aerospace warning for North America; Aerospace control for North America; and Maritime warning for North America.' (NORAD Agreement 2006).

NORAD's initial defence capabilities were based on a set of radar sites built in the mid-1950s that stretched from coast to coast providing for the detection of aircraft entering North American airspace. Figure 1 shows that for Canada there were eventually three lines of radar sites spread across the country: the Pinetree Line across Southern Canada, the Mid-Canada Line generally along the 55th parallel and the Distant Early Warning (DEW) Line across the 70th parallel (roughly 200 miles North of the Arctic Circle (Lawson and Sawler 2012).

Completed in 1957, the 57 sites of the DEW Line were operational until the 1980s when the line was replaced by the NWS which became operational in 1987/88. (DewLine Adventures). Now approaching 35 years of operating, discussions on replacing or upgrading the NWS are in the news, the subject of think tanks and academics and as indicated earlier, the topic of discussion between Prime Minister Trudeau and President Biden.

Although beyond the scope of this study, the Lackenbauer et al. reference *The Distant Early Warning (DEW) Line: A Bibliography and Documentary Resource List* prepared for the Arctic Institute of North America at the University of Calgary provides an excellent list of resources on the DEW Line in

Figure 1. NORAD radar sites during the early years. Source: 'Lawson and sawler, NORAD in 2012 – Ever Evolving, Forever Relevant.' *Canadian Military* Journal 12, no.3 (2012).

Canada. The document provides information on archival resources, published documents and official agreements and government records (Lackenbauer, Farish, and Arthur-Lackenbauer 2005). A similar set of material is provided for the United States history of the DEW Line by Thomas Ray (Ray 1965). For Canada specifically, Joseph Jockel's *Canada in NORAD 1957–2007: A History* provides a well-researched examination of Canadian involvement in the bi-national command and what Ottawa sought to achieve (Jockel 2007). More recently a series of studies by the University of Manitoba's Centre for Defence and Security Studies looked more specifically at NORAD and the NWS issues that exist today and what needs to be done moving forward (Charron and Fergusson 2014, 2015 ; Charron and Fergusson 2020).[2]

The North Warning System Today

The first of the three studies by Charron and Fergusson *NORAD in Perpetuity? Challenges and Opportunities for Canada* deals with the notion of NORAD in Perpetuity and discusses the defence relationship that exists between Canada and the United States. As the first of three studies this first study introduces some of the existing challenges that face both nations, but with emphasis on Canada, as a result of the changing security environment. The second study '*LEFT of BANG': NORAD's Maritime Warning Mission and North American Domain Awareness* deals more specifically with the 2006 addition of a maritime warning mission. This second study provides the reader with the origins of the maritime warning mission, identifies some of the difficulties in implementing the new mission, the information and intelligence flows required by both nations to fulfill the maritime warning mission, how warning and reaction to an event will occur and the perceptions and value-added of NORAD in the maritime warning mission (Charron and Fergusson 2015). The third study *NORAD: Beyond Modernization* looks at a number of 'issues facing the binational command within the context of the Permanent Joint Board on Defense (PJBD) mandated Evolution of North American Defense (EvoNAD) study' (Charron and Fergusson 2019, 3). The study addresses the three main areas of

concern that exist today for the defence of North America within the context of NORAD. These are (Charron and Fergusson 2019, 4):

- the modernization of the North Warning System (NWS),
- plans for a new NORAD Combined Forces Air Component Commander (NORAD CFACC), and
- other issues related to the EvoNAD study ongoing by NORAD, Canadian Joint Operations Command (CJOC) and US Northern Command (USNORTHCOM).

Over the same time period as these three larger studies, other shorter pieces dealing with similar issues have been published (see, for example, Charron and Fergusson 2017; Fergusson January; J. Fergusson 2020; Charron September; Charron 2020; O'Shaughnessy and Fesler September; O'Shaughnessy, Terrence J and Fesler 2020; Charron and Fergusson 2021). All of these shorter pieces deal with the need to modernize/replace the NWS, the cost of replacing the system and in some cases the political challenges for Canada around Ballistic Missile Defence and how these issues complicate Canada's NWS renewal. In addition, the North American and Arctic Defence and Security Network at Trent University has published a book-length manuscript *Shielding North America: Canada's Role in NORAD Modernization* (Teeple and Dean 2021) that deals with emerging threats and how Canada can best contribute to modernizing NORAD.

The NWS in Canada today is a series of 47 long- and short-range radars that stretch across the Arctic from the Yukon to Labrador as shown in Figure 2. The system is remotely monitored and controlled by NORAD from the Canadian Air Defence Sector, located at 22 Wing, North Bay, Ontario. Appendix A provides a list of the NWS sites for Canada. The DND Backgrounder announcing the award of the contract to Nasittuq indicated 'As the NWS was constructed between 1986 and 1992, its radar capabilities are becoming increasingly challenged by modern weapons technology, including advanced cruise missiles and hypersonic weapons. After nearly 30 years in operation, it is time to begin investing in a new, more modern system in order to respond effectively to new and emerging threats.' ((DND Backgrounder 2022a).

The 14 August 2021 Joint Statement on NORAD Modernization by Canada's Minister of National Defence (MND) and the United States Secretary of Defense (SecDef) indicated that modernization

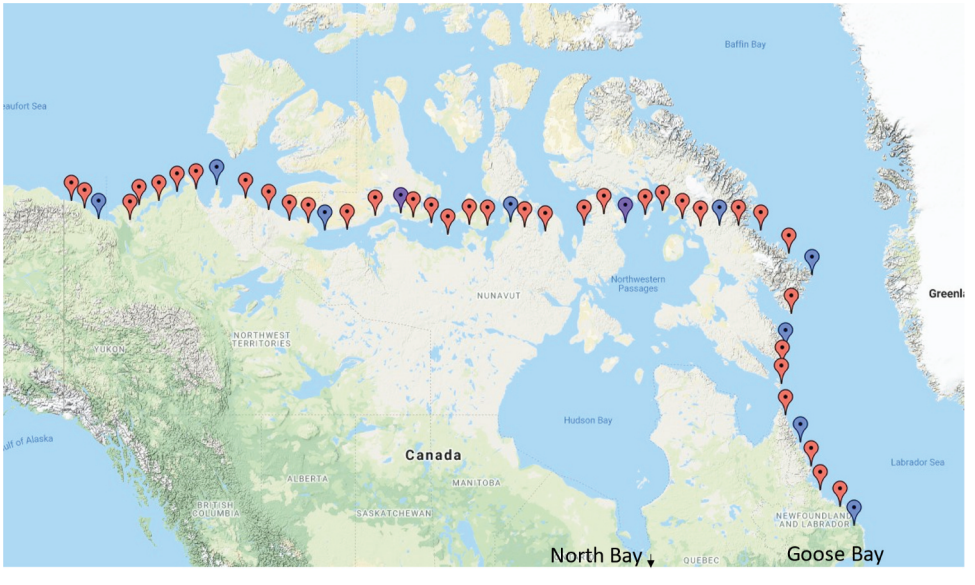

Figure 2. North warning system Today. Source: Canadian Military Family Magazine, 18 February 2022.

was to be based on investment in four priority areas: Situational Awareness; Modernized command and control systems; Capabilities to deter and, if necessary, defeat evolving aerospace threats to North America; and Research, Development, and Innovation (DND 2021). In addition to NORAD modernization and the issues around maritime warning, each of these priorities will also influence how the two nations go about modernizing the system. How each of the nations perceive the security and environmental challenges today and into the future will also influence how they approach NORAD and NWS modernization.

Canada's 2021 federal budget indicated that $252 M over 5 years would be allocated to support NORAD modernization. More specifically budget 2021 indicated:

> Budget 2021 proposes to provide $163.4 million over five years, starting in 2021-22, with $111.1 million in remaining amortization, to support NORAD modernization. This investment would lay the groundwork for NORAD's future, including through research and development of cutting-edge technologies that can detect and defend against threats to the continent. (Finance 2021, 289)

Budget 2021 also identified funds to sustain the existing continental and Arctic defence capabilities (Finance 2021, 289). The budget was followed by the 14 August 2021 Joint Statement on NORAD Modernization discussed above.

North Warning System Renewal and the Arctic Security Environment

'Strong at home, secure in North America and engaged in the world' is the language utilized in Canada's defence policy. Since its release in 2017 the security environment has changed significantly, particularly with the recent Russian invasion of Ukraine. But even without the recent Russian attack, the security environment in Canada's North is very different today than when the NWS was established in late 1980s and early 1990s. Exploitation of natural resources, cyberattacks, Russian bombers, Chinese interpretations of the Law of the Sea, and climate change providing opportunities for increased maritime traffic are all potential threats to Canada's safety and sovereignty in today's national security environment (McDonald 2020).

The Commander of NORAD, General O'Shaughnessy, indicated in testimony to the Senate Armed Services Committee 'The strategic threat to the homeland has entered a new era. Key adversaries Russia and China have deployed and continue to advance a range of capabilities to hold the homeland at risk with nuclear, conventional, and cyberspace weapons, believing it to be an effective means of offsetting Western military advantages and limiting our options in a crisis' (O'Shaughnessy 2020, 3). Statements like this demonstrate the clear military and security challenges facing Canada and the US and others have articulated similar concerns (Shaughnessy and J. Fergusson 2020; O'Shaughnessy, Terrence J and Fesler 2020; Raymond and Munier 2021). But discussions on modernizing the NWS have generated a much broader debate about how Canada needs to view the requirement.

Nancy Teeple's *Great Power Competition in the Arctic* raises the issue of how the region was not as accessible in the past as it is today and notes 'today as a result of climate change altering the seasons so that the Arctic is ice-free for longer periods of the year, opening up the region to increased navigation, resource exploration, and scientific research. Today's challenges are multifaceted and involve traditional and non-traditional security threats' (Teeple 2021, 1). Trent University's North American and Arctic Defence and Security Network has published a variety of books and monographs dealing with arctic defence and security issues beyond the traditional military security perspective. Issues such as arctic arms control (MacDonald 2020), using civil-military operations to expand and deepen relationships with northern communities (Kikkert and Whitney Lackenbauer 2020), and maritime security and boundary issues (Lackenbauer, Lalonde, and Riddell-Dixon 2020 provide a sampling of the issues being addressed by the Network. The Networks' research page website https://www.naadsn.ca/research/ lists pages of references from the last few years and provides multi- and inter-disciplinary work in the areas of defence in Canada, defence of North America and circumpolar and international security.

One of the key issues that becomes obvious when addressing how to modernize the NWS in an evolving arctic security environment is the need to have the local indigenous Inuit population engaged. Fergusson noted that all of the approval processes for NWS modernization are far more complicated than when the system was originally installed. At that time the system went from design to deployment with little public attention or scrutiny. Today the modernization[3] of the NWS 'will likely entail a lengthy regulatory process with public scrutiny. Environmentalist groups are unlikely to remain silent. Moreover, the government will have to engage Indigenous communities in the Canadian Arctic in meaningful consultations, which will take time and become potentially divisive' (J. Fergusson 2020, 5). Without an immediate vital threat to Canada's existence as a nation, national security issues alone will not be sufficient to move the NWS modernization forward. Economic benefits, Innuit engagement and favourable climate change initiatives will be essential.

In addition to these political realities that will require greater consultation, modernizing the NWS to meet today's requirements also implies a system with 'a significant "look-down" capability to ensure that NORAD meets its mission to deter, detect and defend, and these capabilities will need to be integrated into a "systems of systems" solution' (Charron and Fergusson 2019, 62). This will also add to the overall economic cost for modernization.

On 20 June 2022 the MND announced that Canada would be investing $4.9 billion over the next 6 years to modernize continental defences and $40 billion over the next 20 years (MND Speech 20 June 2022c). Referring to the joint statement with the US SecDef in June 2021, the Minister's Speech described five areas that would be funded – Detection, Technology-Enabled Decision-Making, Defensive Capabilities, Infrastructure and Support Capabilities and Science and Technology. In dealing with each of these areas the Minister provided additional information on the types of initiatives that were being addressed and highlighted the government's commitment to working with Indigenous and Northern communities.

North Warning System and Leveraging Spending for Economic Benefit

The treaty for the NWS indicates costs associated with the system would be funded on a 60/40 percent basis between the United States and Canada. (Agreement 1985). Although not guaranteed, there is an expectation that modernization of the NWS would be done under similar circumstances but as Fergusson (2020) notes what is and is not included in any framework agreement will be open to negotiation. Since the original agreement was based on the roles and missions at the time, there are no past guidelines for dealing with the new requirements that will need to be addressed with any replacement/modernization. Estimated costs for modernization are expected to be around $11 billion with Canada's share at $4.4 billion and this could be larger depending on final sharing arrangements and capabilities desired.

Regardless of the eventual cost, government practice (and policy) is to ensure there are economic benefits to Canadians when large defence investments are made. More specifically and relevant to NWS modernization was the 35% Innuit Benefits criteria that was part of the assessment criteria for selecting the winner for the recent operation and maintenance contract awarded to the Nasittuq corporation. The Nasittuq corporation is an Inuit registered firm held by three shareholders: the Nunasi Corporation in Iqaluit, Pan Arctic Inuit Logistics (PAIL) in Ottawa and ATCO Frontec Ltd from Calgary. As indicated earlier, the contract is for $592 million with options for an estimated $1.3 billion if the contract is extended. What benefit this investment and the subsequent NWS replacement or modernization will provide to the three territories and Labrador is what this study will now discuss.

DND captures defence spending in a variety of ways to meet both government requirements and its own record of where money is spent within Canada. The impact of spending at military installations on local communities is provided via socio-economic studies on a regular basis and spending by federal electoral district is captured annually. In addition, other organizations and individuals look at the impact of defence spending on specific industries or the benefits in a particular region of the country.

Socio-economic studies look at the impact of a particular military installation on its host community. In simple terms, the studies look at the military and civilian wages associated with a military installation and its operations and maintenance spending and provides an indication of the impact that has on the host community in terms of its economy and demographics. A large installation-like Canadian Forces Base Petawawa will have a larger impact on its host community of Pembroke, Ontario than Canadian Forces Base Esquimalt has on its host community of Victoria, British Columbia. Socio-economic studies on the impact of military installations on their local communities have been done in 1992, 2000, 2006, 2011 and 2017.

Unlike socio-economic studies, spending by electoral district looks at the financial impact of DND spending on an electoral district. These reports provide an indication of the number of people employed by DND that can be traced to the electoral district and a breakdown of the DND expenditures in terms of people, operations, capital, grants and contributions and departmental revenue. Annual electoral district spending since 2010 is available for the purpose of this study.

Studies looking at the economic impact of defence spending in Canada are much more varied and inconsistent over time than the socio-economic and electoral district studies. Although there is earlier work on the impact of defence spending, the 1983 study by the Centre for Studies in Defence Resources Management (Treddenick 1983) at the Royal Military College of Canada in Kingston was the first of a number of regular examinations for a significant period of time. The 1983 study examined the impact of defence expenditures using four different economic models and set the stage for the use of one particular economic model for the subsequent annual studies by the Centre. The Centre was a casualty of the government's budget reduction in the mid to late 1990s and the last regular study was done in 1997.[4] Since 1997 only a limited number of examinations have been conducted, some based on academic work for graduate degrees (for example, Lemon 2001) and some based on sponsored research (for example, Perry and Craig Stone 2021.

More recent examinations of defence spending have been completed with a focus more specifically on the defence industry rather than the Canadian economy as a whole. Since 2014 Statistics Canada has been conducting regular surveys with the defence industry and the aerospace industry and has provided reports on the impact of the defence industry on the Canadian economy (ISED 2016, 2018, 2020). These documents present data by industry area and by region of the country and are based on survey data that looks at individual firms and the economic information they provide to Statistics Canada in their survey answers. A related but separate area has been the studies that were completed to examine the economic benefits of the National Shipbuilding Strategy, the Irving and Seaspan shipyards (PricewaterhouseCoopers 2017; Seaspan Shipyards 2020) and the next-generation fighter acquisition (OMX 2017, 2020; PricewaterhouseCoopers 2018).

All of these different studies have different strengths and weaknesses but in the context of looking at the economic benefits in the North none of them will answer a micro-level question such as 'What is the economic benefit in Tuktoyatuk, Northwest Territories (NWT) of replacing the short-range radar in Tuktoyatuk?'. However, the socio-economic and electoral district studies do provide trends and an ability to make informed assumptions about what more macro-level benefits could occur at the territorial and provincial level. The most recent Perry and Stone study (Perry and Craig Stone 2021) also provides data on GDP multipliers that will be useful for looking at possible outcomes. In addition, any economic activity from an increase in spending that occurs at the installation or within the electoral district as a result of NWS modernization can be forecasted based on past results.

Input-Output Models are generally used to simulate the economic impact of an expenditure or to analyze the interdependence of industries in the economy. Input-Output model simulations use multipliers and provide an estimate of the 'economic impact per dollar of output delivered to final demand . . . economic impact is estimated for output, gross domestic product and its components, jobs and imports' (Statistics Canada 2023). It is important to highlight that the use of Statistics Canada's Input-Output model for examining economic impact is not without criticism. The model does not necessarily deal with technological progress and industry's need to adjust its input requirements and if the economy is in full

employment the model will fail to show where and how resources are re-allocated, what the implications are for economies of scale and supply constraints (Treddenick 1983).

More importantly, economic analysis is also about studying economic agents and here Input–Output models also fail to incorporate economic behaviour by agents in response to variations in prices. These limitations can be mitigated by combining other economic models that emphasize dynamics or the behaviour of economic agents. Solomon and Yazbek (2011) refer to the Computable General Equilibrium (CGE) model discussed by Treddenick (1983) as a mirror opposite of Input–Output models in its assumption of input resources and price signals. CGE models assume that factor products are fully employed and any demand shock (expenditures in consumption or investment) will result in labour and capital being re-allocated in response to price changes. Solomon and Yazbek also discuss other models such as the more elaborate simultaneous equation model of Canada designed to capture the dynamics of economic shocks, the intermediate processes and the duration of the shock on the Canadian economy as well as a system dynamics model. Importantly, they note "In a resource rich environment, running multiple models will get one closer to approximating reality, but in a resource constrained environment, choices are inevitable' (Solomon and Yazbeck 2011, 10).

The reality is that when studying economic shocks at a sub-regional level the customized run of Statistics Canada's Input-Output models used in this study is the only dataset available to tackle it. Recent studies have also used Input-Output models because of the detailed inter-industry data to tease out the economic consequences of negative shocks like terror attacks, disasters, etc.

Table 1 provides data from the last three socioeconomic studies. The data in the table is provided for the military installations in the three northern territories (Yukon, Northwest Territories and Nunavut) and Labrador. In addition, the data for North Bay is provided since it is where the NWS is monitored. Only data from the last three studies is provided because these three studies provided the data in a consistent manner. For example, the 2000 study provided a value-added multiplier rather than a GDP multiplier. It also provided direct, indirect and induced impacts while other studies only provided direct and indirect impacts. The 1992 study is not included because Nunavut did not exist as a separate territory until 1999 and significant cuts were made to the military in the mid to late 1990s as part of the government's deficit reduction activities. Any comparison to more current data would be difficult.

What is obvious from the three studies captured in Table 1 is there is no specific installation for the Yukon and Nunavut. This is not the same as stating there is no military presence in the territory but rather that there was not a large enough installation/presence to warrant being included in the study. The data in Table 1 show a significant decrease in impact for Goose Bay between 2006 and 2011. This is primarily based on a reduction in both military and civilian personnel employed at the base. Military personnel (Regular and Reserve) went from 85 in 2006 to 62 in 2011 while civilian employees went from 262 down to 42. Military numbers increased slightly to 80 in 2017 while civilian numbers decreased to 32.

Figure 3 shows the trend lines of DND net expenditures in constant 2020-21 dollars for those electoral districts that contain NWS radar sites. The North Bay electoral district of Nipissing-Timiskaming is also included. The data for Figure 3 is provided in Table 2 and shows that there has been a decrease in spending in all of the districts during the past decade. The one exception is the significant increase for the Northwest Territories in FY 2020-21 and this is connected to what appears to be a one time $30 M Grants and Contribution award for a capital assistance programme. The complete electoral district data for the locations captured in Figure 2 is provided in budget year dollars at Appendix B.

The third type of defence expenditure information discussed above was the economic impact of defence spending. At the macro-Canadian level only the recent study by Perry and Stone (2021) provides current data and what is important from this study is the discussion on multipliers, because the multiplier data will be useful in trying to assess the economic impact of NWS modernization. In this context their study was based on having Statistics Canada run input-output model simulations using DND spending data connected to the Supply and Use Product Codes in the model. The

Table 1. Socio-economic data.

		Local spending impact ($M)			Employment impact			
	Spending by the military installation ($M)	Direct	Indirect	Total	Direct	Indirect	Total	GDP multiplier
Yellowknife								
2006	11.45	10.66	3.29	13.9	142	10	152	1.21
2011	21.35	20.38	6.23	26.061	270	6	276	1.25
2017[a]	21.92	20.15	0.58	20.73	265	2	267	1.15
Goose Bay								
2006	56.121	42.44	16.6	59.04	363	169	532	1.05
2011	7.98	7.02	3.44	10.46	108	5	113	1.31
2017	13.96	9.29	0.21	9.50	115	2	117	1.12
North Bay								
2006	36.27	34.22	22.90	57.11	610	99	709	1.58
2011	36.91	33.78	22.91	56.69	534	70	594	1.54
2017	44.55	39.60	2.23	41.83	538	21	559	1.34

[a]Note that in 2017 the study also included induced impacts for all three installations. The induced impacts make the numbers larger for total employment and spending impacts than what is shown in the Table. For example, the induced impact for North Bay in 2017 is 16.44 which would make the total direct, indirect and induced impact 58.26. One might conclude from this that the other reports included the induced impact in the indirect data but that is not the case.

Source: DND Socio-Economic Studies (Parai 2006). (Gardner Pinfold, 2011) and (Prism Economics 2017).

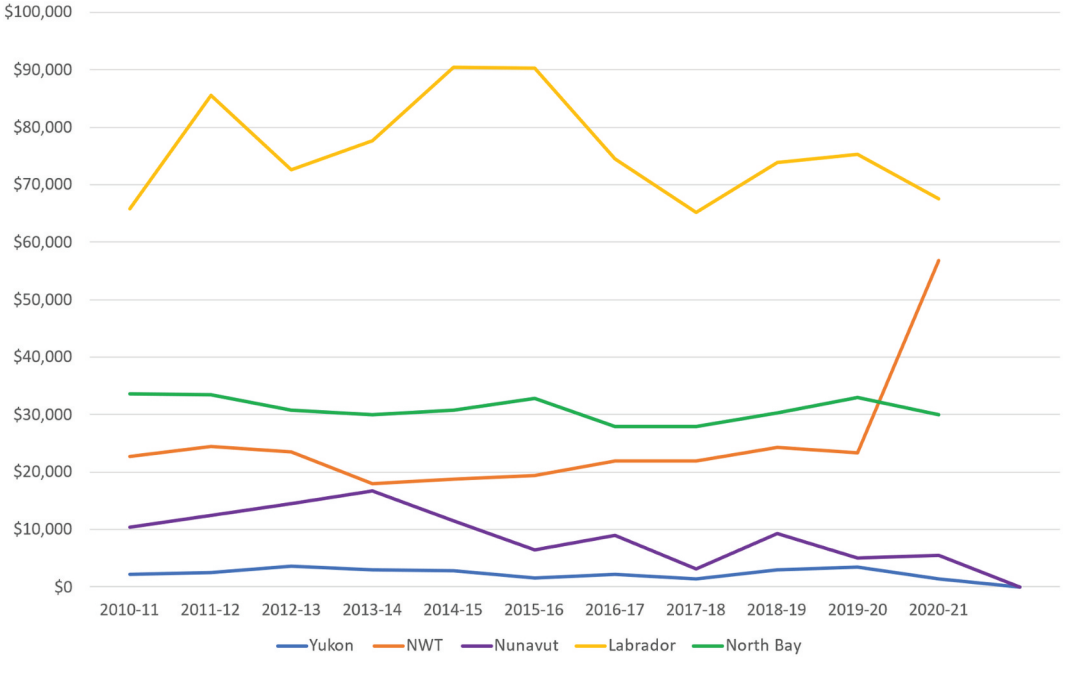

Figure 3. Electoral district net expenditures in constant FY2020-21 ($000).

relevant multiplier for looking at the impact of spending on the NWS would be the multiplier from the Direct and Indirect benefits or in the language of Statistics Canada Input-Output simulations the Simple multiplier. This is generally consistent with the methodology utilized in the socio-economic studies to determine the impact of spending in host communities.

Multipliers in the Statistics Canada Input-Output simulations provide an estimate of the impact per dollar of output delivered to final demand. Information on economic impact is estimated for output, GDP and jobs categories provided in Table 3.[5] Simple multipliers capture the sum of direct

Table 2. Electoral district net expenditures in constant 2020-21 $ ($000).

Electoral District//Fiscal Year	Yukon	Northwest Territories	Nunavut	Goose Bay Labrador	North Bay
2010/11	2,208	22,729	10,332	65,870	33,648
2011/12	2,432	24,410	12,477	85,544	33,478
2012/13	3,532	23,505	14,506	72,676	30,727
2013/14	3,021	18,010	16,661	77,666	29,929
2014/15	2,790	18,695	11,431	90,483	30,766
2015/16	1,599	19,339	6,427	90,253	32,806
2016/17	2,215	21,901	8,946	74,564	27,974
2017/18	1,433	21,976	3,187	65,186	27,857
2018/19	3,037	24,211	9,356	73,900	30,256
2019/20	3,438	23,401	5,090	75,338	32,922
2020/21	1,469	56,775	5,508	67,535	29,969

Source: DND Estimated Expenditure by Electoral District & Province. Multiple Years.

and indirect impacts. Simple multipliers are based on the assumption that households are exogenous and that there is no feedback between wages and production. Mathematically, a simple multiplier is equal to (direct + indirect impacts) divided by $1 of exogenous demand. A Type 1 multiplier expresses the simple multiplier as a multiple of the direct impacts. Mathematically, a type 1 multiplier equals the simple multiplier (direct + indirect) divided by the direct impacts. For example, the simple jobs multiplier shows the direct and indirect impacts on jobs of $1 million worth of output of a given industry, while the type 1 jobs multipliers show the direct and indirect impact on jobs of one job in a given industry. There are similar definitions for Total multipliers and Type 2 multipliers, but they are not being utilized in this study so are not included.

Table 3 provides a selection of multiplier data from Statistics Canada at the national summary level and the provincial and territorial summary level. In addition, the multipliers from the Perry and Stone study are provided for DND defence expenditures at the national level for Operating and Capital expenditures that are specific to the defence spending data utilized for the simulation. More broadly when Statistics Canada captures economic data there are different multipliers for different industries. For example, the 2018 Output multiplier for the Transportation and Warehousing Industry is 1.725 with 7.52 jobs per million dollars of output. In contrast, the same data for the Professional, Scientific and Technical Services industry is 1.489 and 8.626, respectively (Statistics Canada 2021b).

Similar analysis is often conducted at the provincial and territorial level. The NWT Bureau of Statistics (2021), for example, published a report on multipliers for the different industries in their territory. They will use Statistics Canada information and input-output model simulations, but the results are specific to the territory. This leads to differences like a jobs per million dollars of output in the Transportation and Warehousing industry being 2.6 in 2017 compared to the 7.8 at the national level.

Table 3 has a sample of multiplier information at the national summary level and at the provincial and territorial summary level. At the provincial and territorial level Table 3 provides the multiplier for all provinces and the multiplier within the province.[6] The table has multipliers for all industries and then three specific industries that would likely be part of any NWS modernization. The intention here is to highlight that additional micro-level analysis is possible when final decisions on options are made by the government. The Perry and Stone study multipliers are provided to highlight that any spending done by defence as part of NWS modernization will have economic benefit, but it will not be the same as what may be possible from other sectors of the economy. But if Canada is to get serious about the new requirements for economic benefits in the North the downward trend in defence expenditures that has occurred in the North over the past decade will need to change.

These differences in multipliers combined with the uncertainty of what the NWS replacement will be and where the actual money will be spent leads to a range of possibilities. A straight-forward DND replacement of the existing radars at the existing sites done through capital spending by DND is one solution and this would allow the use of the capital spending multiplier information in the Perry and Stone study. This would likely be one extreme for possible options. As noted above, addressing the current security environment and the changes to NORAD's role since the NWS was established

Table 3. Statistics Canada Multiplier Data.

Statistics Canada Data				
Input-output multipliers, summary level				
Simple multiplier	All industries	Non-residential building construction	Transportation and warehousing	Professional scientific and technical services
Output	1.558	1.637	1.725	1.489
GDP at Basic Prices	0.826	0.774	0.857	0.901
Jobs per million dollars of output	7.558	7.390	7.530	8.626
Type 1 Multiplier				
GDP at Basic Prices	1.539	1.723	1.664	1.440
Jobs per million dollars of output	1.557	1.738	1.681	1.499
Provincial and Territorial multipliers, summary level				
	Nunavut	NWT	Yukon	NL
All provinces				
Output	1.622	1.615	1.557	1.438
GDP at Basic Prices	0.790	0.828	0.882	0.810
Jobs per million dollars of output	5.544	5.262	8.018	5.826
Within province				
Output	1.176	1.201	1.242	1.252
GDP at Basic Prices	0.564	0.622	0.719	0.718
Jobs per million dollars of output	3.413	3.525	6.528	4.947
Perry and Stone Study with Defence Expenditures				
Multiplier per dollar of output	Operational Expenditures	Capital Expenditures		
Output				
Simple Multiplier	1.48	0.92		
GDP at Basic prices				
Simple Multiplier	0.85	0.44		
Type 1 Multiplier	1.45	1.66		
Jobs – full-time equivalent (FTE) per million dollars of output				
Simple Multiplier	8.52	3.88		
Type 1 Multiplier	1.35	1.59		

Sources: Statistics Canada. Table 36-10-0013-01 Input-output multipliers, summary level. DOI: https://doi.org/10.25318/3610001301-eng; Statistics Canada (2021a). Table 36-10-0113-01 Input-output multipliers, provincial and territorial, summary level. DOI: https://doi.org/10.25318/3610011301-eng; and Perry, David and J. Craig Stone. *Economic Benefits of Defence Spending*. Calgary: Canadian Global Affairs Institute, December 2021. https://www.cgai.ca/economic_benefits_of_defence_spending.

combined with climate change issues, the need for indigenous peoples to be part of the process, and environmental stewardship requirements implies the modernization and replacement will need to be more than just replacing the existing radar sites. A related but perhaps separate issue is whether today's newer technology provides better capability and an ability to achieve that capability with fewer radar sites. Alternatively, does the inclusion of maritime warning and the increased security requirements imply more sites will be required?

The scenarios discussed below provide data on the possible economic impact for various scenarios/options using some of the multipliers contained in the economic data. The intent in presenting these scenarios is to demonstrate the range of possibilities that exist in leveraging the required spending for the NWS modernization to promote economic benefit and employment, particularly in Canada's North. The first scenario will look at the new operations and maintenance contract won by the Nassituq Corporation to provide a starting point for comparison.

Possible Scenarios and Outcomes

Scenario One – New Operations and Maintenance Contract

As indicated earlier, the Nassituq Corporation was awarded a $592M contract for the operation and maintenance of the NWS with an option for renewal for two additional 4-year periods bringing the entire length of the contract to 15 years with a possible investment of $1.3B. (PSPC, 2022). Although this is an operations and maintenance contract there are some aspects that are important when looking at economic benefits. The contract award reflects the government's commitment to strengthening its relationship with Inuit communities and the award announcement indicates:

> The Canadian Content Policy and Canada's obligations under the Comprehensive Land Claims Agreements including the recent Treasury Board of Canada issued *Directive on Government Contracts in the Nunavut Settlement Area* are being applied to this contract to create jobs, innovation and growth in Canada, with a focus on Inuit benefits and northern communities. (DND 2019)

The directive referred to in this quote is a Treasury Board policy issued to ensure the government meets its obligations under article 24 of the *Agreement Between The Inuit Of The Nunavut Settlement Area And Her Majesty The Queen In Right Of Canada*. This article deals with government contracts and commits the government to establish bid criteria that allow for Inuit firms to have an opportunity to bid on contracts. It also spells out the types of issues winning firms must commit to in terms of employment, education and facilities locations (Agreement 1993). The bid award for Nassituq provides a good example of what this implies for future contract awards for the NWS.

For the operations and maintenance contract, scoring for the contract was based on 45% for technical merit, 35% for Inuit benefits criteria and 20% on price. The evaluation criteria for Inuit benefits included 10% each for Inuit Employment; Inuit Ownership; Inuit training and skills development and 5% for location in Nunavut (DND Backgrounder 2022a). Although this is specific to Inservice support it is realistic to conclude that any future contract for NWS modernization will have similar requirements. More specific to looking at how money will be spent, the backgrounder for the award announcement indicates that 50.37% of the contract will be directed to Inuit Benefits with a 1% increase every 2 years (DND Backgrounder 2022a).

Achieving 50% of economic benefit in the North may not be achievable for an actual NWS replacement or modernization but it is clear that the government will be looking for a significant portion of the value of the contract to be demonstrably benefitting northern communities and businesses. Based on this information one can assume at least half of the $592M contract should be spent in the North and contractors from across Canada or elsewhere will be required to ensure their proposals include similar structures as those found in the winning proposal by the Nassituq Corporation.

Using the simple multiplier for all industries output of 1.558, $992M of economic revenue would be generated with around $461M of the value being in the North. The value added to Canadian GDP would be $489M within Canada with perhaps as much as $245M across the North. Similarly, the $992M of output would lead to just under 7500 job years or an average of 1,071 jobs each year over the seven years of the contract half of which could end up in the North.

Should the contract be renewed for the total 1.3B then the results would proportionately larger – just over $2B in output, just under $1.1B in GDP and 15,308 job-years nationally over 15 years and half of these benefits going to Northern communities and industries. One could proportionately distribute these benefits across the three territories and Labrador based on the number of radar sites but that would be problematic without some indication from Nassituq in how they plan to organize for contract implementation.

Scenario 2 – Replace the Existing 47 Radar Sites with 47 Upgraded Radars

This scenario assumes that the government does not do much to deal with the changing security environment and new roles for NORAD but rather just goes ahead with modernizing or replacing the 47 existing sites. Under this scenario Canada's expected 40% of the $11B modernization cost or $4.4B

would be utilized for determining economic benefits. Following a similar logic as above with respect to the requirement for a contractor to demonstrate economic benefits for northern territories, a band of possibilities is calculated using 30, 40 and 50 percent as the amount of activity to be conducted in the North. This recognizes that the skill sets required for modernization may not immediately exist in northern communities, both in terms of workforce skillsets and manufacturing capability. There is an assumption that any bid that wins will have to meet at least the 30 % threshold in order to be competitive with other proposals.

Under these assumptions $4.4B spent over the next two decades would generate revenue over $6.8B and $3.6B in value added to GDP. Output of $6.8B would lead to over 51,000 job-years or an average of 2550 jobs per year s over the life of the new radar system. For benefits specifically in northern communities and businesses, 30% of this would be over $2B, $1.1B for GDP and 15,300 job-years while 50% would $3.4B, $1.8B and 25,500 job-years, respectively. The 40% option would be $2.4B, $1.4B and 20,400 job-years.

Scenario 3 – Implement a New North Warning System That Deals with the New Security Environment

This scenario assumes that the government decides to modernize the NWS in a way that also deals with maritime warning, environmental issues and climate change and the increased security threats in the arctic. This implies two things. First, the cost will likely be more than the currently discussed $11B and second, the increased costs will likely need to be paid for by Canada since the United States will not likely be interested in paying for climate change, environment, Indigenous peoples and other Northern development issues specific to Canada. Under these assumptions the results from scenario 2 can be expanded by adding increments of $1B to the $4.4 B utilized in scenario 2. For each $1B increment, output revenue would increase by $1.558B, the value added to GDP would be $826M with 7580 jobs connected to the activity. Options for economic activity in northern communities would be 30,40 and 50 percent of these totals.

The variable in this scenario is how much of this would be a shared cost with the United States and how much would be Canada's responsibility. There is significant scope for Canada to increase spending in the North beyond NWS modernization with a clear view to deal with all of the new issues discussed above and promote economic growth and development for northern communities.

Scenario 4 – Modern Technology and Increased Capability

Under this scenario, it is assumed that new technology comes with increased capabilities with greater ranges and sensitivities for detection and therefore requiring fewer actual radar sites. There are no data provided for this option beyond leveraging data in scenarios 2 and 3. This scenario highlights that fewer sites could reduce the cost of NWS modernization and replacement but historically for defence-related acquisitions new technology is actually more expensive. It is quite possible that fewer sites will cost more money depending on what the government obtains in terms of capability. Under these circumstances, the methodology in scenario three would be applicable. More important in the context of future research, this opens the door for additional examination of specific options within the territories based on which locations are chosen from the existing 47 sites or if totally different site locations are required to leverage the capabilities of the new technology. For example, the Arctic Over the Horizon Radar initiative is designed to provide long-range surveillance of northern approaches and will be established in Southern Ontario at a cost of up to $3B (Pugliese 2023).

Scenario 5 – Modern Technology Leads to No Requirement for North Warning System Radar Sites in Canada's North

This scenario is included because Canada has expertise in the space industry and advances in technology could allow for the operational requirements for aerospace defence and maritime warning to be completed without the need to replace any of the existing 47 radar sites. Canada

Table 4. Summary of scenario data.

Scenario	Economic impact				Job creation	
	GDP impact $B	Revenue impact $B	Possible GDP impact for Northern Communities $B	Possible revenue impact for northern communities $B	Jobs In Canada	Possible jobs in the North
Scenario One – Initial Contract (7 years)	0.489	0.992	0.245	0.461	7,500	3,750
Scenario One – Extended Contract (15 years)	1.1	2.0	0.550	1.0	15,308	7,654
Scenario 2 40% of $11B cost sharing	3.6	6.8	30% – 1.1 40% – 1.4 50% – 1.8	30% – 2.0 40% – 2.4 50% – 3.4	51,000	30% – 15300 40% – 20,400 50% – 25500
Scenario 3–$1B Incremental increase over $4.4B in Scenario 2	0.826	1.6	30% – 0.25 40% – 0.33 50% – 0.41	30% – 0.48 40% – 0.64 50% – 0.8	7580	30% – 2,274 40% – 3,032 50% – 3,790

would need to deal with closure and environmental cleanup but there would be no specific economic benefits to the North under this option. Any control aspects would likely continue to be conducted from North Bay.

This is a realistic scenario based on the June 2022 announcement by the MND that detailed the investment areas for NORAD modernization and this included a space-based surveillance project (DND 2022c). Space-based capabilities will be part of the NWS modernization and that will have an impact on the final set of requirements for the NWS. It is not unreasonable to consider some combination of radar sites and space-based assets as a solution for the NWS. Consequently, some combination of the benefits in scenarios 2 and 3 would be the result. Table 4 provides a summary of the results for scenarios 1 through 3 with data from scenarios 4 and 5 being some combination of data in the first three scenarios depending on decisions made by the government.

Future Research and the Requirement for Government Decisions

This study has only taken a rough order of magnitude look at possible economic benefits to Canada's three northern territories and Labrador based on the requirement for modernizing the NWS, a critical issue for the future defence of Canada and North America. As discussed in this study, there have been significant changes in the security environment since the existing NWS was established in the late 1980s and early 1990s. Even before the recent Russian invasion of the Ukraine there were multiple perspectives on what Canada needs to do in the Arctic to protect its sovereignty, deal with climate change and the environment, resource extraction, northern shipping and Inuit consultation, all in addition to the primary requirement to modernize the NWS. The Russian invasion of Ukraine has made some of these issues more urgent.

The government needs to make some decisions on how it will deal with some of these issues and whether or not the modernization of the NWS will be part of the overall plan. Some of these issues can perhaps be separate from the NWS but some of them have to be part of the modernization. The NORAD requirement for maritime awareness means the NWS modernization has to deal with an Arctic Ocean that is navigable all year and not just during the summer months. Once these decisions are made, a number of more detailed studies can occur. The Minister of National Defence's announcement in June of investing $40 billion over the next 20 years implies the government is in fact looking at more than just replacing the actual radar sites as part of its plan to improve Canada's security in the Arctic and North America.

Based on the government's specific decisions, it will be possible to develop more localized studies based on where and what capabilities are being developed and implemented. For example, some of the industry-specific multiplier information can be utilized to determine where the most benefit can be

achieved and where emphasis needs to be placed in order to leverage that potential. Since the governments' agreement with the Inuit of the Nunavut Settlement Area will likely be applicable to the other territories, more clarity on the types of economic benefits and how much of a contract value should be focused on the North should be refined so that contractors know where to focus their efforts.

This study has highlighted the requirement to deal with new challenges and identified some possible economic benefits based on some assumptions. There is limited data available to the public but within government some of the multiplier data available from Statistics Canada's input-output model can be leveraged by federal and territorial government organizations with economic data and contractor proposals to do more micro-level analysis. The government should be striving to know what the economic benefit is to Tuktoyatuk when the radar site at their location is modernized. Governments at all levels should be able to answer this question for every other northern community with a radar site or economic activity related to modernizing the NWS.

Notes

1. All figures are Canadian Dollars unless otherwise indicated.
2. These studies were completed as part of a project funded by a Defence Engagement Programme grant and although Charron and Fergusson are the primary authors, a number of other experts and scholars contributed to the development and conclusions in the three studies. They are all identified individually in each of the three separate reports. Charron and Fergusson note that the project's origins pre-date the launch of NORAD's 'NORAD Next' study that looks out over several decades into the future. The NORAD Next study was launched by General Jacoby, Commander NORAD and Northern Command from 2011 to 2014, in 2013. The study was designed to examine the current state of NORAD, and its immediate future, and identify and evaluate current issues, or areas of concern relevant to NORAD and its place within Canada-U.S. North American defence cooperation.
3. Note that although modernization is used throughout the document and many of the references, modernization can also mean replacement of the existing system with a new system.
4. The annual studies were completed by a number of different people, often people connected to the Centre to complete graduate level work at the University.
5. An output multiplier provides the revenue generated from the direct and indirect activities and includes some double counting while the GDP multiplier is the value added of the same activities.
6. At the provincial level this *all provinces* and *within province* difference is dealing with the reality that spending money in one province may result in economic activity in other provinces. For example, when DND purchased and installed the radars for the NWS, some of the material for the assembly of the radars came from other provinces, which generated economic activity in that province and some of the material came from the radar site's home territory or province. See Ziad Ghanem, *The Canadian and Inter-Provincial Input-Output Models: The Mathematical Framewor*k (Ottawa: Statistics Canada, Industry Accounts Division April 2010), 20.

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Appendix A Canadian North Warning Sites

	Site Name	Site Type	Location	Info
			YUKON	
1	BAR-1	SRR	Komakuk Beach	Established Oct 1990
2	BAR-B	SRR	Stokes Point	Established Jul 1991
3	BAR-2	LRR	Shingle Point	Established Jun 1989
			NWT	
4	BAR-BA3	SRR	Storm Hills	Established Nov 1990
5	BAR-3	SRR	Tuktoyatuk	Established Sep 1990
6	BAR-DA1	SRR	Liverpool Bay	Established Nov 1990
7	BAR-4	SRR	Nicholson Peninsula	Established Oct 1990
8	BAR-E	SRR	Horton River	Established Jun 1991
9	PIN-MAIN	LRR	Cape Perry	Established Aug 1989
10	PIN-1BD	SRR	Keats Point	Established Jul 1991
			NUNAVUT	
11	PIN-1BG	SRR	Croker River	Established Aug 1991
12	PIN-2A	SRR	Harding River	Established Sep 1991
13	PIN-CB	SRR	Bernard Harbour	Established Sep 1991
14	PIN-3	LRR	Lady Franklin Point	Established Jun 1989
15	PIN-DA	SRR	Edinburgh Island	Established Oct 1991
16	PIN-EB	SRR	Cape Peel West	NWS operations ceased Oct 1991
17	CAM-MAIN	LRR/LSS	Cambridge Bay	Established Sep 1989
18	CAM-A3A	SRR	Stuart Point	Established Oct 1991
19	CAM-1A	SRR	Jenny Lind island	Established Oct 1990
20	CAM-B	SRR	Hat Island	Established Sep 1991
21	CAM-2	SRR	Gladman Point	Established Oct 1990
22	CAM-CB	SRR	Gjoa Haven	Established Oct 1990
23	CAM-3	LRR	Shepherd bay	Established Jul 1989
24	CAM-D	SRR	Simpson Lake	Established Sep 1991
25	CAM-4	SRR	Pelly Bay	Established Sep 1991
26	CAM-5A	SRR	Cape McLoughlin	Established Jul 1992
27	CAM-FA	SRR	Lailor River	Established Aug 1992
28	FOX-MAIN	LRR/LSS	Hall beach	Established Sep 1989
29	FOX-1	SRR	Rowley Island	Established Aug 1991
30	FOX-A	SRR	Bray Island	Established Aug 1991
31	FOX-2	SRR	Longstaff Bluff	Established Nov 1990
32	FOX-B	SRR	Nudlaudjuk Lake	Established Oct 1991
33	FOX-3	LRR	Dewar Lakes	Established Jul 1989
34	FOX-CA	SRR	Kangok Fjord	Established Sep 1992
35	FOX-4	SRR	Cape Hooper	Established Dec 1990
36	FOX-5	SRR	Broughton Island	Established Dec1990
37	DYE-MAIN	LRR	Cape Dyer	Established Aug 1989
38	BAF-2	SRR	Cape Mercy	Established Jul 1992
39	BAF-3(RES-X-1)	LRR	Brevoort Island	Established Oct 1988
40	BAF-4A	SRR	Loks island	Established Aug 1992
41	BAF-5(RES-X)	SRR	Resolution Island	Established Sep 1991
			LABRADOR	
42	LAB-1	SRR	Cape Kakiviak	Established Jul 1992
43	LAB-2	LRR	Saglek	Established Nov 1988
44	LAB-3	SRR	Cape Kiglapait	Established Aug 1992

(*Continued*)

(Continued).

	Site Name	Site Type	Location	Info
45	LAB-4	SRR	Big Bay	Established Sep 1992
46	LAB-5	SRR	Tukialik	Established Oct 1992
47	LAB-6	LRR	Cartwright	Established Nov 1988

SRR – Short Range Radar – AN/FPS-124 radar
LRR – Long Range Radar – AN/FPS-177 radar
LSS – Logistic Support Site

Appendix B Electoral District Data (Budget Year dollars)

Yukon

	Number of Regular Force Personnel	Number of Civilian Personnel	Number of Reserve Force Personnel	Net Income $(000)	Operations and Maintenance Spending $(000)	Capital $(000)	Grants and Contributions $(000)	Revenue $(000)	Net Expenditures $(000)
2010-11	11	5	10	731	1,755	83	-	(1)	2,568
2011-12	9	4	9	563	1,709	151	328	(6)	2,745
2012-13	8	4	9	445	2,402	586	507		3,939
2013-14	8	3	5	404	2,490	75	344	(1)	3,311
2014-15	8	2	5	418	1,576	689	348	(10)	3,021
2015-16	6	1	5	259	1,273	83	128	(1)	1,742
2016-17	11	1	6	339	2,009	44		(16)	2,377
2017-18	6	2	12	336	1,141	32		(3)	1,505
2018-19	8	2	9	407	1,147	1,591		-	3,145
2019-20	6	2	5	339	1,798	1,372		(1)	3,508
2020-21	5	2	6	321	848	300			1,469

Northwest Territories

	Number of Regular Force Personnel	Number of Civilian Personnel	Number of Reserve Force Personnel	Net Income $(000)	Operations and Maintenance Spending $(000)	Capital $(000)	Grants and Contributions $(000)	Revenue $(000)	Net Expenditures $(000)
2010-11	182	23	82	12,477	13,536	324	141	(37)	26,441
2011-12	174	25	102	12,764	14,390	467	-	(70)	27,552
2012-13	169	21	132	15,263	10,788	561	-		26,213
2013-14	181	19	105	12,774	6,729	244	-	(10)	19,737
2014-15	198	24	93	13,578	6,066	464	137		20,245
2015-16	207	30	84	14,019	6,863	79	109		21,069
2016-17	216	27	67	15,708	7,731	70	-	(8)	23,501
2017-18	224	26	89	14,626	6,373	2,080	-	(5)	23,073
2018-19	214	21	72	14,442	7,701	2,937		(6)	25,073
2019-20	231	26	71	15,222	6,837	206	1,634	(18)	23,881
2020-21	237	25	68	15,949	8,044	2,782	30,000		56,775

Nunavut

	Number of Regular Force Personnel	Number of Civilian Personnel	Number of Reserve Force Personnel	Net Income $(000)	Operations and Maintenance Spending $(000)	Capital $(000)	Grants and Contributions $(000)	Revenue $(000)	Net Expenditures $(000)
2010-11	6	0	13	409	11,020	590	-	0	12,019
2011-12	10	0	16	449	13,292	342			14,083
2012-13	4	0	26	280	15,869	28			16,178
2013-14	6	0	7	271	17,959	28			18,258
2014-15	5	0	8	257	12,122	-			12,379
2015-16	5	0	10	262	6,618	-	123		7,002
2016-17	5	0	9	297	5,892	12	3,938		9,599
2017-18	5	0	16	338	3,008	-			3,346
2018-19	5	0	9	262	9,427	-			9,689
2019-20	4		10	263	4,930				5,194
2020-21	5		8	365	5,143				5,508

Labrador

	Number of Regular Force Personnel	Number of Civilian Personnel	Number of Reserve Force Personnel	Net Income $(000)	Operations and Maintenance Spending $(000)	Capital $(000)	Grants and Contributions $(000)	Revenue $(000)	Net Expenditures $(000)
2010-11	75	40	18	5,777	72,078	1,142	-	(1,371)	76,626
2011-12	76	35	19	5,182	89,600	3,746		(1,974)	96,555
2012-13	81	33	23	5,443	74,392	3,191		(1,974)	81,051
2013-14	79	33	14	5,645	76,812	4,861	6	(2,213)	85,112
2014-15	79	34	15	5,575	90,233	3,647		(1,471)	97,983
2015-16	86	31	11	5,797	88,206	5,235		(910)	98,328
2016-17	87	34	7	5,983	70,775	4,295		(1,044)	80,010
2017-18	79	38	20	5,818	60,701	2,924		(1,004)	68,439
2018-19	103	42	18	7,064	67,476	3,144		(1,155)	76,530
2019-20	101	37	10	6,409	69,479	1,724		(730)	76,882
2020-21	99	37	11	6,352	61,608	696		(1,111)	67,535

North Bay

	Number of Regular Force Personnel	Number of Civilian Personnel	Number of Reserve Force Personnel	Net Income $(000)	Operations and Maintenance Spending $(000)	Capital $(000)	Grants and Contributions $(000)	Revenue $(000)	Net Expenditures $(000)
2010-11	513	81	210	28,684	6,171	4,581	-	(294)	39,142
2011-12	503	84	204	29,510	6,153	2,432		(309)	37,787
2012-13	486	76	209	26,629	5,525	2,220		(106)	34,268
2013-14	487	64	170	26,717	6,096	206		(221)	32,798
2014-15	471	65	172	25,363	5,899	2,212		(158)	33,316
2015-16	446	60	164	24,015	10,794	1,011		(79)	35,741
2016-17	442	65	127	23,316	6,297	547		(142)	30,017
2017-18	446	70	140	24,064	4,656	649		(123)	29,247
2018-19	414	77	152	23,955	6,027	1,470		(119)	31,333
2019-20	411	65	148	23,811	7,267	2,630		(110)	33,597
2020-21	424	63	135	24,295	4,567	1,129		(21)	29,969