

I. Introduction and Study Outline

Crandon Mining Company (CMC) has proposed to build a 5,500 ton/day underground mine to produce zinc and copper in northern Wisconsin. The estimated project life is about 35 years, including 3 years of construction, 28 years of production, and 4 years of reclamation. According to Foth & Van Dyke (FVD), the preparers of the project's state-mandated Environmental Impact Report (EIR), the Crandon mine will provide direct permanent employment for about 525 operations people, and create indirect and induced employment for about another 350-400 people (FVD, 1995a). Peak employment during the latter part of the construction phase is estimated at almost 800 people. Facilities proposed for the Crandon Mine site include an underground mine, an ore concentrating plant, water treatment facilities, tailings deposit area, a water discharge pipeline, and several infrastructure items such as a railroad spur, and an access road. The current proposed Crandon Mine is the second project proposed for the 55 million ton zinc-copper orebody. In the mid-1980s Exxon Minerals proposed a somewhat different mining plan which was later shelved.

This study examines reports that have been issued which describe and quantify the expected socioeconomic impacts from the proposed Crandon Mine on the affected communities in the mine area. In particular, this study focuses on the probable and possible impacts of the additional population expected from the opening of the mine in the mine-vicinity communities of Forest, Langlade, and Oneida Counties, Wisconsin.

Section II of this report discusses the assumptions that were used to estimate the magnitude and distribution of the population increase expected from the mine. Alternative assumptions are then used to estimate a wider range of possible impacts and outcomes from the mine than those discussed in the review documents. Section III of this study examines the implications of the larger mine-related population influx to affected communities that are estimated in this report. Section IV discusses other possible mine-related impacts that are not fully described in the existing studies. Section V presents a summary and conclusion of this study.

II. Partial Review of Existing Socioeconomic Impact Methodologies and Assumptions

A. Local Hire Rate

A great many of the socioeconomic impacts of the proposed Crandon Mine on the affected communities are driven by the number of people that are expected to move into the region as a result of the Project. The greater the number of immigrants to the region, the larger the expected impacts from the Mine. A critical assumption that governs the estimate of immigrating people is the local hire rate.

With a high local hire rate, the assumption is that the Crandon Mine could hire most of its workers from current residents of the study area. The remainder of the workforce would then be hired from outside the study area and moved into the region. If most of the project's new workforce was drawn from existing residents of the study area, the socioeconomic impacts of new residents demanding services such as housing, water, waste water treatment, roads, health and human services, etc. on the region's infrastructure would be minimized. Conversely, if many or most of the new workforce would have to be imported into the region, demands on the region's

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infrastructure would be maximized.

An ideal scenario for the region would be for all of the project's workforce to be hired from current residents of the study area. In this case the workers would presumably be drawn from the existing pool of unemployed workers. Alternatively, the project could induce currently employed people in the region to switch from existing jobs to employment at the Crandon Mine. Presumably the positions vacated by the new Crandon Mine workers would then be filled from unemployed study area residents. The net result of this 100 percent local hire assumption would be that the main benefits of the Crandon Mine--the expansion of the tax base and the additional demand for goods and services by the Mine from current study area businesses--would be realized, but very few additional services would be required because no new residents would move into the study region.

A worst case scenario for the region would be 0 percent local hire assumption where every Crandon Mine worker would come from outside the study area. In this case the expansion of the tax base would be the same as the 100 percent local hire case, but all of the new residents would have to be added to current residents' demand for services and infrastructure, creating the maximum possible negative socioeconomic impact on the region.

It is clear that both Crandon Mine Project sponsors have recognized the importance of hiring local residents rather than importing the bulk of their workforce. The Crandon Mining Company has issued strongly worded commitments to maximizing local hires.

While the sponsors' stated commitment to employing the greatest number of current study area residents is commendable, the bottom line is that the skills of the existing workforce in the study area must be a close match for the skills required at the Mine. Unemployed study area residents must not only be willing and available for work at the Mine, they must also have the proper skills and education, or be capable to be trained for the skills needed at the proposed Crandon Mine.

Table 1 shows an average value for the expected educational attainment needed by Crandon Mine workers.

Table 1 - Permanent Work Force by Job Type and Educational Requirements

Job Type	Minimum Educational Requirements (Average Number Needed)							Total
	College Degree	College Degree Percent	Technical Degree	Technical Degree Percent	High School	High School Degree Percent	Job Type Percent	
Administration	8.5	89%	1	11%	0	0%	2%	9.5
Accounting/ Purchasing	7	28%	9.5	38%	8.5	34%	5%	25
Marketing	1	25%	1	25%	2	50%	1%	4
Environmental/ Safety	3	21%	5	36%	6	43%	3%	14
Human Resources	3.5	58%	2.5	42%	0	0%	1%	6
Mine	12	6%	13.5	6%	182.5	88%	45%	208
Mill	5.5	9%	12	19%	47	73%	14%	64.5
Maintenance	3	2%	112	85%	17	13%	29%	132
Total	43.5	9%	156.5	34%	263	57%	100%	463

Source: Foth and Van Dyke, 1995a, Table 4.2.13-3.

Note that almost 60 percent of the projected mine jobs are located in the mine and mill. Although less than 20 percent of these mine and mill jobs require a college or technical degree, job requirements and needed skills for underground metal mine and mill operators are extremely specific. Additionally, the workers having the specific skills for these highly specialized jobs are almost certainly not located in the study area. Indeed, owing to the very small number of these types of mines in this country, there are few workers having underground metal mining skills in the United States. Workers skilled in operating metal mills are more prevalent in this country, but there are likely very few skilled mill operators located in this region--an area containing no operating metal mines or mills.

This supposed lack of trained mine and mill workers in the region is borne out by statistics. In 1992 only 75 people out of a total work force of more than 22,000 were employed in mining (FVD, 1995b, p. 3.14-12). The Foth and Van Dyke report also discusses the general age characteristics of the region's existing labor force, "[t]he proportion of the study area's population between the prime working ages of 15 to 64 is significantly lower than this proportion for the state as a whole. This reflects the relatively large number of study area retirees and out-migration of youth." (FVD, 1995b, p. 3.14-17). In 1992, the aggregate unemployment rate of the three study-area counties was slightly above the Wisconsin rate of 5.1%, and significantly below the national average of 7.4% (FVD, 1995b, p. 3.14-18).

All of the above data point to the difficulties that Crandon Mine would have in attracting

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skilled mine and mill operators from the population that currently resides in the study area. Even the other jobs at the proposed Mine, which require somewhat less-specialized skills than the mine and mill positions, would likely be hard to fill. With a retiree-dominated population and a relatively low unemployment rate, the study area likely will not be able to supply a large number of people with the right mix of skills, age, and experience for Crandon Mine's needs.

Despite the documented mismatch between study area population and Crandon Mine employment needs, Foth and Van Dyke assert in their middle case estimates of employment, that 70 percent of the permanent labor force and the indirect and induced jobs will be hired from within the study area (FVD, 1995b, p. 4.2.13-72). While Foth and Van Dyke did perform some calculations using a local hire rate of 60 percent, the discussion and analysis in the text primarily dealt with the middle case. The Denver Research Institute, in a 1986 study of a previous Crandon Mine proposal, assumed that only 50 percent of the workers could be found in study area (FEIS, 1986, p. 176). Lookout Mountain Analysis asserts that a local hire rate for these positions could reasonably be expected to be as low as 30 percent, or perhaps even lower.

This study shows estimates of the immigrating population and school enrollments from Foth and Van Dyke's middle case, and a Lookout Mountain Analysis case using a lower local hire rate. All other assumptions and methodologies calculated in this study are identical to those used by Foth and Van Dyke. Some of the major assumptions used in these mine-related estimates are shown below:

	<u>Foth and Van Dyke Middle Case</u>	<u>Lookout Mountain Analysis</u>
<u>Local Hire Rate</u>		
Operations	70 percent	30 percent
Indirect/Induced	70 percent	30 percent
Construction	20 percent	10 percent
Average Worker Family Size	3.01 people	3.01 people
School Children/ Worker	0.7	0.7
Public School Enrollment Rate (% of total eligible children)	90.6 percent	90.6 percent

Table 2 shows the difference between the Foth and Van Dyke and Lookout Mountain estimates of mine-related population, due solely to different local hire assumptions.

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Table 2 - Mine-Related Population Impacts Estimates

Year	Mine-Related Population Estimates		Population Difference	
	Foth & Van Dyke Middle Case	Lookout Mountain Analysis	People	Percent
1997	488	838	350	72%
1998	759	1,358	599	79%
1999	1,175	2,218	1,043	89%
2000	715	1,772	1,057	148%
2001	732	1,839	1,107	151%
2002	758	1,898	1,140	150%
2003	765	1,915	1,150	150%
2004	768	1,922	1,154	150%
2005	783	1,957	1,174	150%
2006	764	1,913	1,155	151%
2007	736	1,848	1,112	151%
2008	735	1,846	1,111	151%
2009	735	1,846	1,111	151%
2010	735	1,846	1,111	151%
2011	760	1,905	1,145	151%
2012	768	1,922	1,154	150%
2013	767	1,919	1,152	150%
2014	792	1,978	1,186	150%
2015	728	1,829	1,101	151%
2016	729	1,831	1,102	151%
2017	753	1,888	1,135	151%
2018	759	1,903	1,144	151%
2019	759	1,903	1,144	151%
2020	772	1,932	1,160	150%
2021	726	1,825	1,099	151%
2022	726	1,825	1,099	151%
2023	726	1,825	1,099	151%
2024	724	1,820	1,096	151%

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Year	Mine-Related Population Estimates		Population Difference	
	Foth & Van Dyke Middle Case	Lookout Mountain Analysis	People	Percent
2025	724	1,820	1,096	151%
2026	723	1,818	1,095	151%
2027	723	1,818	1,095	151%
2028	308	573	265	86%
2029	310	601	291	94%
2030	59	102	43	73%
2031	15	36	21	140%
2032	5	13	8	160%
2033	5	13	8	160%
2034	5	13	8	160%
2035	5	13	8	160%

Source: Foth and Van Dyke, 1995a, and this study.

Figure 1 presents the numbers shown in Table 2 in a graphical format. Using identical methodologies and assumptions as Foth and Van Dyke--except for the local hire rate, Lookout Mountain Analysis projects almost 1,200 additional people moving into the study area as a result of the mine. The additional population is not confined to one small time period, but is extended for virtually the entire 28 year period of mine operations. The significance of the 1,200 possible additional people to the rural region are examined in the section below.

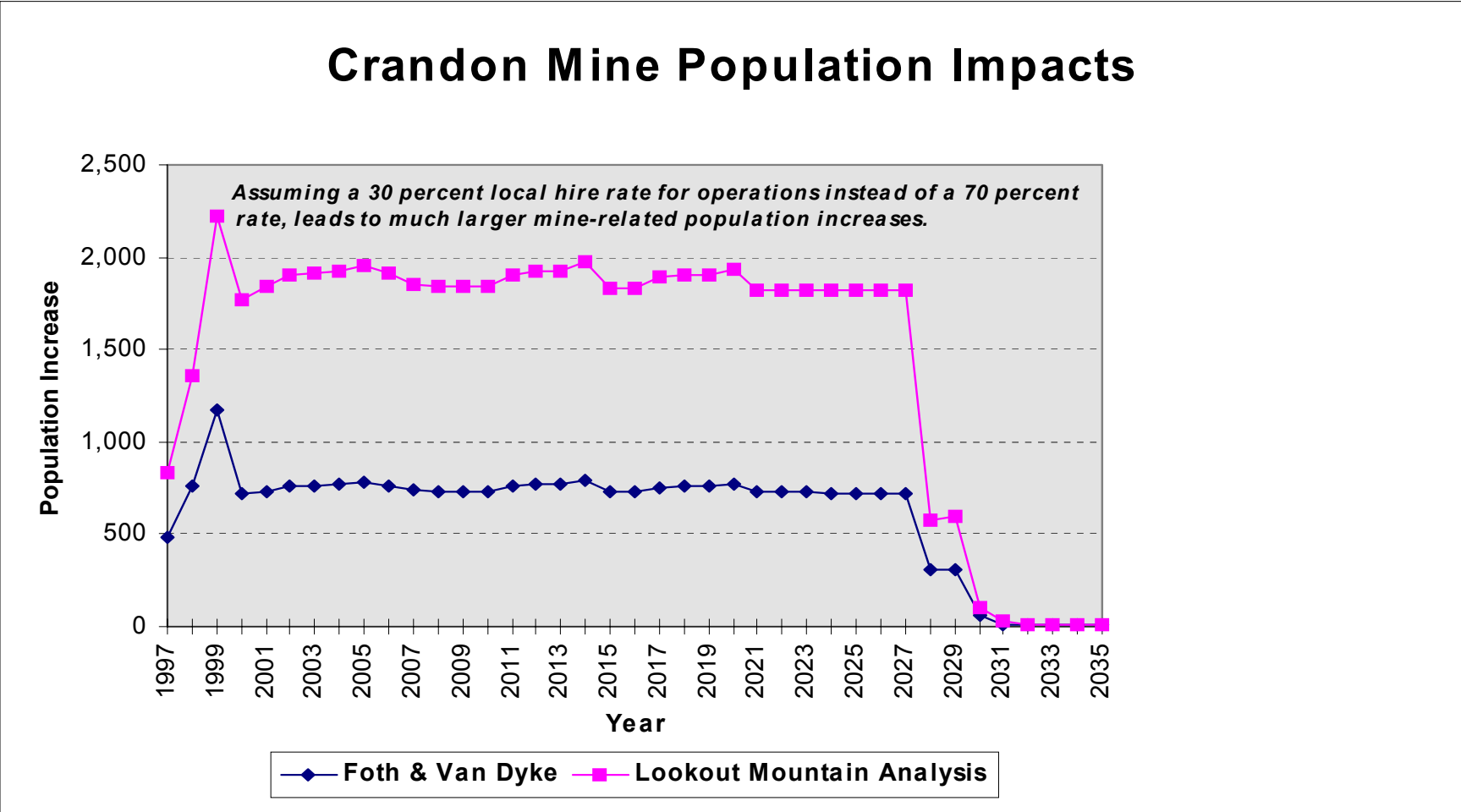
III. Assessment of Additional Population Impacts

A. School Enrollment

Clearly Foth and Van Dyke estimates of school enrollments will be impacted by the addition of about 1,200 additional people moving to the study area as a result of the Crandon Mine. Figure 2 shows a Lookout Mountain Analysis estimate of the additional students that might be expected above and beyond the Foth and Van Dyke middle case estimates. Again, the Lookout Mountain Analysis estimates use the virtually the same methodologies and assumptions as Foth and Van Dyke, but the additional impacts flow from the additional immigrating population estimated from the smaller local hire rate.

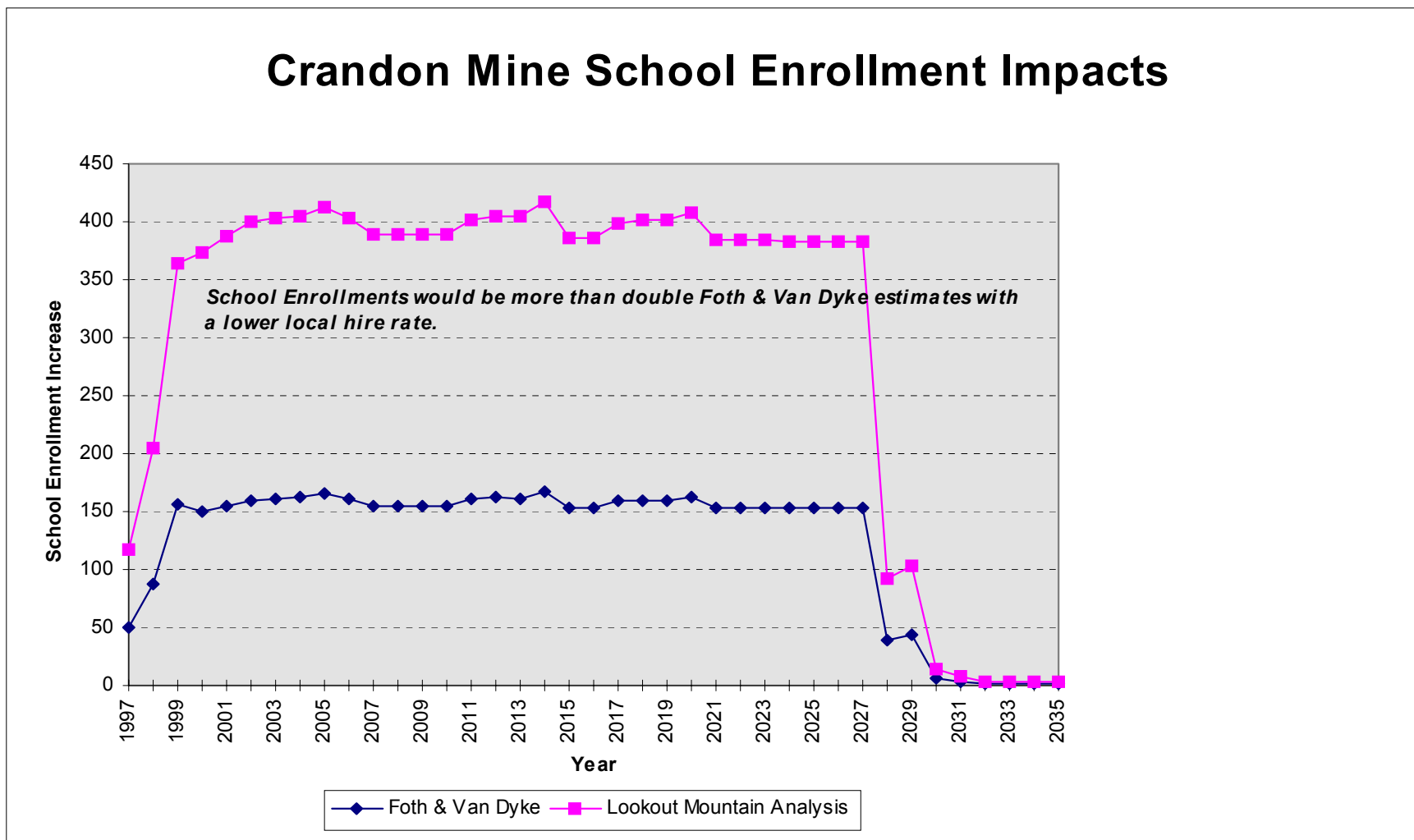
Throughout the projected Crandon Mine life the extra student enrollments attributed to the lower local hire rate range from about 220 to 250. Thus, while Foth and Van Dyke expect impacts of about 150-160 students, Lookout Mountain Analysis estimates that as many as 417 mine-related students might be expected.

Figure 1 - Mine-Related Population Impacts



Source: Foth and Van Dyke, 1995a, and this study.

Figure 2 - Mine-Related School Enrollment Impacts



Source: Foth and Van Dyke, 1995a, and this study.

B. Intra-Study Area Population Impacts

The distribution of possible population impacts within the study area is also worth investigating. Foth and Van Dyke have used a gravity model to forecast the locations within the study area that the additional people would likely settle. The factors that influence where a person may settle within the study area are based on (1) retail sales locations, (2) proximity to the Mine, and (3) housing availability (Foth and Van Dyke, 1997, personal communication). All other things being equal, the gravity model predicts that mine-related populations will tend to preferentially locate (1) closer to areas with retail services, (2) closer to the Mine, and (3) in areas with greatest housing and/or building site availability. Using their gravity model, Foth and Van Dyke have distributed the expected population impacts within the study area.

Applying the Foth and Van Dyke distribution pattern for the year 2005 to the 1,957 mine-related people estimated by Lookout Mountain Analysis (30 percent local hire assumption) gives the results shown in Table 3.

**Table 3 - Distribution of Mine-Related Population in 2005
Lookout Mountain Analysis 30 Percent Local Hire Case**

Locality	Mine-Related People	Percent of 2005 Baseline	Locality	Mine-Related People	Percent of 2005 Baseline	Locality	Mine-Related People	Percent of 2005 Baseline
Argonne	10	1.8%	Ackley	5	1.0%	Crescent	18	0.9%
Blackwell	3	0.6%	Ainsworth	33	6.6%	Enterprise	8	3.0%
Caswell	3	2.2%	Antigo, City	293	3.3%	Lake Tomahawk	10	1.0%
Crandon, City	280	13.0%	Antigo, Town	40	2.9%	Monico	13	4.5%
Crandon, Town	60	11.7%	Elcho	50	4.5%	Newbold	18	0.7%
Freedom	8	2.4%	Evergreen	5	0.9%	Pelican	70	2.2%
Hiles	5	1.7%	Langlade, Town	13	2.8%	Piehl	3	3.1%
Laona	58	4.2%	Neva	18	1.7%	Pine Lake	28	1.1%
Lincoln	98	13.0%	Norwood	10	1.2%	Rhineland	488	6.7%
Nashville	98	9.0%	Parrish	3	2.9%	Schoepke	20	5.3%
Popple River	3	5.3%	Peck	5	1.2%	Stella	8	1.3%
Ross	3	1.9%	Polar	15	1.5%	Sugar Camp	13	0.8%

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Locality	Mine-Related People	Percent of 2005 Baseline	Locality	Mine-Related People	Percent of 2005 Baseline	Locality	Mine-Related People	Percent of 2005 Baseline
Wabeno	28	3.2%	Price	10	3.7%	Three Lakes	55	2.4%
FOREST COUNTY, TOTAL	651	7.0%	Rolling	13	0.8%	Woodboro	5	0.6%
			Upham	13	1.8%	ONEIDA COUNTY, TOTAL	753	2.2%
			White Lake	13	4.0%			
			Wolf River	15	1.8%			
			LANGLADE COUNTY, TOTAL	553	2.7%			
			STUDY AREA, TOTAL	1,957	3.1%			

Note: Due to independent rounding county totals many not be the sum of the localities.

Source: Foth and Van Dyke, 1995a, and this study.

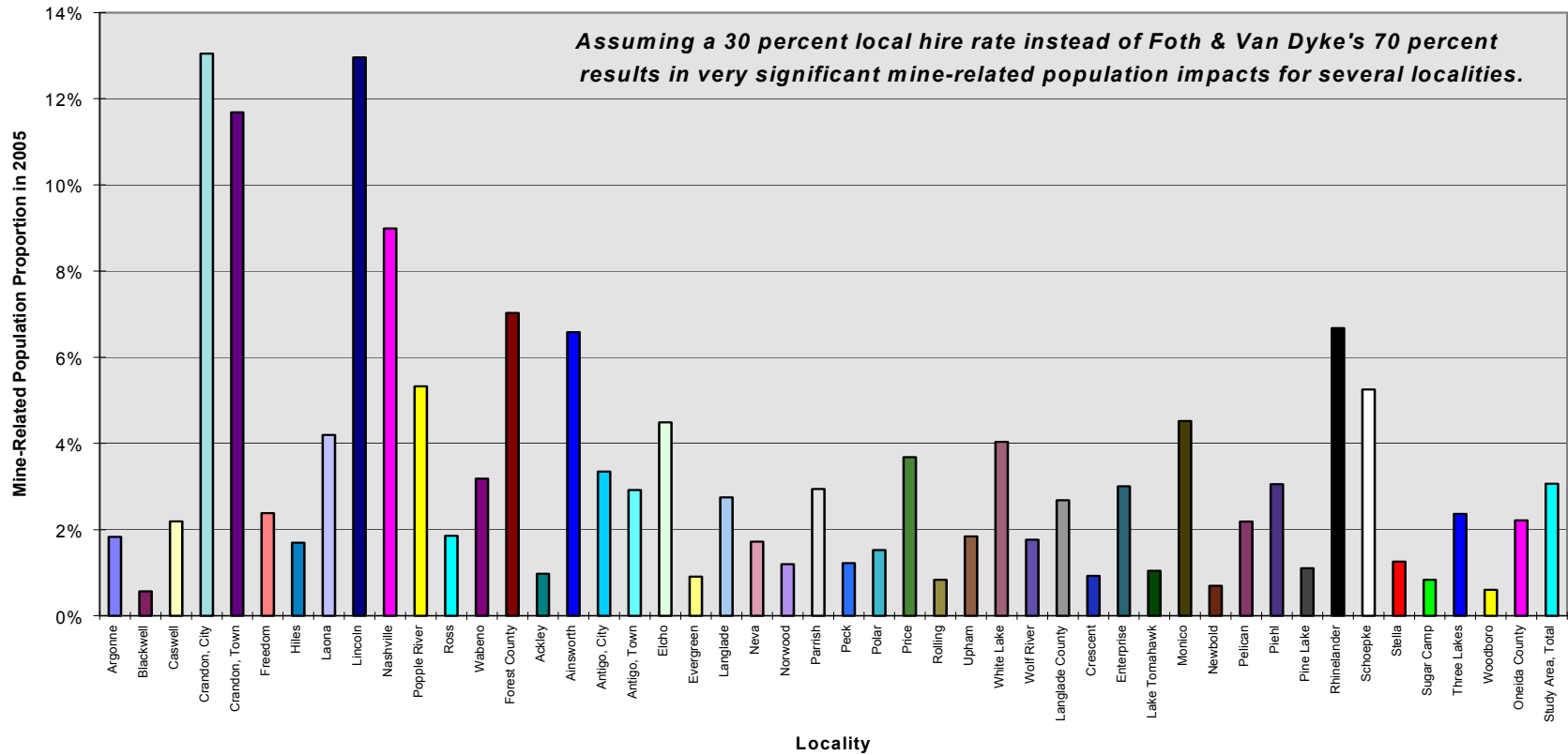
A 30 percent local hire rate results in some very significant population increases for several of the localities in the study area. Forest County absorbs the bulk of the mine-related population impacts. The population in the county as a whole would increase 7 percent due to mine-related immigrants. The city and town of Crandon and the town of Lincoln could all expect population increases of about 12-13 percent due to the mine. The town of Nashville in Forest County would also likely receive a mine-related population influx of almost 9 percent.

Population increases in the Langlade and Oneida would probably be less dramatic, but still significant. The city of Rhinelander in Oneida County would grow by almost 7 percent--almost 500 people, due to mine-related activity. Overall, the three-county study area could expect to have a population increase in 2005 of slightly more than 3 percent.

These population influx results are a marked contrast to those projected in the Foth and Van Dyke study. In 2005, using Foth and Van Dyke's 70 percent local hire rate, the maximum projected mine-related population increase would be shared by the town of Lincoln and the city of Crandon--5.2 percent (FVD, 1995a, p. 4.2.13-73). Lookout Mountain Analysis calculations show a population increase that is 150 percent higher than the Foth and Van Dyke results.

Figure 3 - Distribution of Mine-Related Population Impacts Within the Study Area in the Year 2005.

Crandon Mine-Related Population Impacts Lookout Mountain Analysis Local Hire Case



Source, Foth and Van Dyke, 1995a, and this study.

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C. School Impacts

The impact of the population influx due to the mine is expected to be differentially felt in Forest County. In particular the town of Lincoln, and the city and town of Crandon are likely to experience the greatest proportional population increases, and therefore require the largest proportional increases in the level of government services provided.

School expenditures and enrollment in the Crandon school district are projected to peak in the 2000-2010 time period. With a possible addition of about 410 students in 2005, the study area could receive impacts that may force the building of additional capacity. However, because the Crandon Mine would lie within the Crandon school district, the tax base of that locality would be enriched by the economic activities related to the mine.

D. Property Impacts

Additional effects on property in the Lincoln and Crandon areas are likely to be felt as a result of increased population immigration of this study. As a starting point for estimating the likely minimum property impacts, the middle case of the Foth and Van Dyke study annual expenditures for the city of Crandon, the town of Crandon, and the town of Lincoln are projected to increase by about 4.5 percent, 4.5 percent, and 5.5 percent in the 2000-2010 time period, respectively. Concurrent with these expenditure increases, the three localities are also projected to experience increases in the total equalized property value ranging from about 4.5 to 5 percent (city and town of Crandon), to over 200 percent (town of Lincoln). Obviously, the huge property value increase is a direct result of the inclusion of the Crandon Mine in the tax base.

Property tax rates in the city and town of Crandon in the 2000-2010 time period show increases of about 3 to 6.5 percent. Property tax rates are forecasted to decrease in the town of Lincoln by about 1 to 2 percent--again presumably because of the inclusion of the mine in the tax base. According to the Foth and Van Dyke middle case, unless homeowners in the city and town of Crandon sell their homes during mine operations, the net result of the mine is an increase in property values and an increase in the tax rate--resulting in a larger tax bill for residents of these communities.

The Foth and Van Dyke study cautions about the "expenditure-revenue gap" experienced because of the lag between the time that new residents are added to the tax roles (and therefore demand additional government services), and the time that taxes are actually collected from these new residents. Clearly the effects of this gap are likely to be especially severe in the early stages of the Crandon Mine, and especially in the three localities discussed above.

Lookout Mountain Analysis projects an increase in the mine-related population for the city and town of Crandon, and the town of Lincoln more than 150 percent greater the middle case of Foth and Van Dyke. As a result of this much larger impact population impact, the modest property value effects that are projected by Foth and Van Dyke are likely to understate the actual property value impacts with a larger number of new residents.

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E. Water and Wastewater Impacts

A mine-related population increase of 280 people in the city of Crandon would translate into an additional consumption of about 24,600 gallons of water per day, at current per capita consumption rates (88 gallons/day) (FVD, 1995b, p. 3.14-50). This additional consumption corresponds to almost 10 percent of the existing combined ground and elevated storage of 255,000 gallons. With an expected baseline demand of about 190,000 gallons in 2005, the additional demand of almost 25,000 gallons may accelerate the need for building additional water storage capacity. No water data are available in the Foth and Van Dyke reports on the towns of Crandon and Lincoln.

The addition of about 280 people to the city of Crandon would likely add about 25,000 gallons of wastewater to the designed capacity of 260,000 gallons. With an expected future peak of about 210,000 gallons in 2025, the mine-related population increase is not forecasted to force the building of additional wastewater treatment capacity. No wastewater data are available in the Foth and Van Dyke reports on the towns of Crandon and Lincoln.

F. Other Impacts

Foth and Van Dyke identify the current need for doctors, nurses, dentists, and optometrists, as well as the lack of a hospital in Forest County. Certainly a projected increase of 7 percent above the baseline population will only aggravate these currently substandard conditions. Additional police and fire protection services in addition to those identified by the Foth and Van Dyke study, are also likely to be mandated by the additional population increases projected by the Lookout Mountain Analysis scenario.

IV. Other Mine-Related Socioeconomic Impacts Not Fully Discussed in Existing Studies

A. Premature Project Shutdown

The Foth and Van Dyke study does discuss mine-related socioeconomic impacts resulting from temporary suspensions and permanent premature closure. Two scenarios are discussed in the Foth and Van Dyke study, (1) closure immediately after construction, and (2) closure after the zinc-extraction phase (2014).

Foth and Van Dyke assert that closures of up to 6 months would likely have small impacts on the study area because of the availability of unemployment compensation to idled workers. This assertion understates the true severity of the likely impacts of the suspension because (1) unemployment compensation payments are always smaller or much smaller than foregone earnings, and (2) it ignores the impact of these smaller unemployment payments on the indirect and induced business that relies on full output from the Crandon Mine.

A worst case scenario of a permanent closure of the mine immediately after the construction period is also discussed in the Foth and Van Dyke report. Many of the infrastructure items in the surrounding communities will have already been built or will be in the construction stage. The

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sudden departure of many of the expected revenues from the Crandon Mine would be sorely missed. Although the tax base of the Crandon Mine may not be decreased to zero at the time of closure, the bulk of the other payments expected from mine activities would not be forthcoming.

Typically, much uncertainty surrounds mine closures. Mine operators usually track commodity prices and look for favorable trends. Many times skeleton crews are maintained for long periods of time to keep the mines in a standby state, ready to start up again with short notice. This extended period of uncertainty may tempt idled workers to remain in the study area, waiting for a mine reopening that could (or could not) come at any time. As a result of this uncertainty, even if the mine closes, a significant number of former mine workers may remain in the study area, drawing on government resources and awaiting a possible mine reopening.

A good case in point is the Climax molybdenum mine in Lake County, Colorado. In its heyday during the 1970s and early 1980s the mine paid very good wages and was the major employer in the county. However, depressed molybdenum prices since the early 1980s forced the mine into standby status for most of the last decade. As a result of the mine closure, Lake County, Colorado experienced one of the largest drops in personal income and property values in the West. For a brief period in 1996, and accompanied by much fanfare, the mine reopened because of an uptick in molybdenum prices. However, after a short production run the mine returned to standby status where it remains today. Because of the good wages that can be earned when the mine is open, many former workers remain in the area, waiting to be called back to work. However, it is by no means certain that this mine will ever be opened for any appreciable period in the future.

B. Unsuccessful Job Seekers

Another phenomenon that is frequently associated with the opening of large, high-profile projects is the immigration of many applicants for each job at the project. The opening of many gold mines in Nevada over the last two decades is a good example of this. New mine openings were announced which drew unemployed skilled miners from elsewhere, as well as unskilled, inappropriately skilled, or just unemployed people from outside the region. Many of these unsuccessful job applicants remained in the area for relatively long periods of time, hoping to obtain employment at the project. Ultimately some were and some were not be successful in their job quest. But, during the time that they were in the study area, they represented a significant drain on the infrastructure of the region, and demanded a noticeable share of government services. Foth and Van Dyke have apparently not discussed this phenomenon in any of their Crandon Mine studies.

C. Recreation and Tourism in the Study Area

Foth and Van Dyke acknowledge the importance of recreation and tourism throughout the study area. In 1991, almost 200,00 Wisconsin anglers fished in the north-central area of Wisconsin (which includes the study area counties of Forest, Langlade, and Oneida) (FVD, 1995b, p. 3.14-17). While economic measures attributable to the tourism and recreation activities in the region are not available, these activities are quite important in the area. Large scale mining activities and the increased population, traffic, and mine-associated infrastructure may have a negative impact on

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activities such as hunting, hiking, and fishing. Existing socioeconomic impact studies do not quantitatively address these potential negative impacts.

V. Summary and Conclusions

A reassessment of the local hire assumptions contained in the existing literature on socioeconomic impacts reveals that much larger population impacts could be felt from the Crandon Mine. Lookout Mountain Analysis calculations using Foth and Van Dyke methodologies show that mine-related population impacts in the city and town of Crandon, and the town of Lincoln may be underestimated by as much as 150 percent. Total mine-related population increases in Forest County by themselves could increase county population by 7 percent or more. The significance of these unanticipated mine-related population impacts is that school, water, and wastewater infrastructure needs may be underestimated. And, the already documented need for doctors, nurses, other health-care practitioners, police, and fire services in Forest County may be exacerbated by a large, unanticipated mine-related population influx.

Also, existing socioeconomic impact literature does not adequately discuss and quantify likely mine-related impacts related to temporary suspension or permanent closure of the mine, the phenomenon of unsuccessful job seekers, or the likely economic impacts from the mine the important tourism and recreation industry in the study area.

References

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**A Critique of Existing Socioeconomic Impact Reports
Evaluating the Proposed
Crandon Zinc-Copper Mine, Wisconsin**

Prepared for:

The Menominee Indian Tribe of Wisconsin
P.O. Box 910
Keshena, WI 54135-0910

April 2, 1996

Prepared by:

W. Thomas Goerold, Ph.D.

Lookout Mountain Analysis
314 Parkview Avenue
Golden, Colorado 80401

(303) 526-2362