

Projected Number of Future Descendants

prepared for

The Olgoonik Corporation

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Introduction

The purpose of this analysis is to estimate how many descendants of current shareholders will be alive and potentially eligible to receive Class B stock during the next 30 years beginning January 1, 2020. At the start of 2020, there was a backlog of eligible descendants. The youngest shareholder with Class B shares was born on 2/25/2014. Therefore, anyone born after 2/25/2014 is potentially an eligible descendant.

Terms and locations

B1 descendants = B1 shareholders. These are current holders of Class B stock. As of January 14, 2020, there were exactly 1,000 shareholders in the database who own Class B shares. Almost every B1 shareholder owns 100 shares. Two people own 125 and one owns 50.

B2 descendants. These are descendants of the B1 group or descendants of Class A shareholders.¹ They are all born after 2/25/2014. I estimate that about 170 of these B2 descendants are alive as of Jan 1, 2020. These can be thought of as the “backlog.”

Locations. Based on zip codes, I classified the existing B1 shareholders as living in the following locations:

WAINWRIGHT	
OTHER_NSB	other North Slope Borough
OTHER_AK	outside NSB but within Alaska
OUTSIDE_AK	outside Alaska

¹ There may be B2 descendants born between 2014 and 2019 to original shareholder parent(s), but since the youngest female original shareholder is at least 48 years old as of 12/12/19, substantially all *future* B2 descendants will likely come from B1 or B2 parents.

Existing B1 shareholder population

The 1,000 existing B1 shareholders are spread about equally among Wainwright (34%), Other North Slope Borough (33%), and Other Alaska/Outside Alaska (33%). See Figure 1 and Table 1.

Figure 1. Location and age structure of existing (B1) shareholders

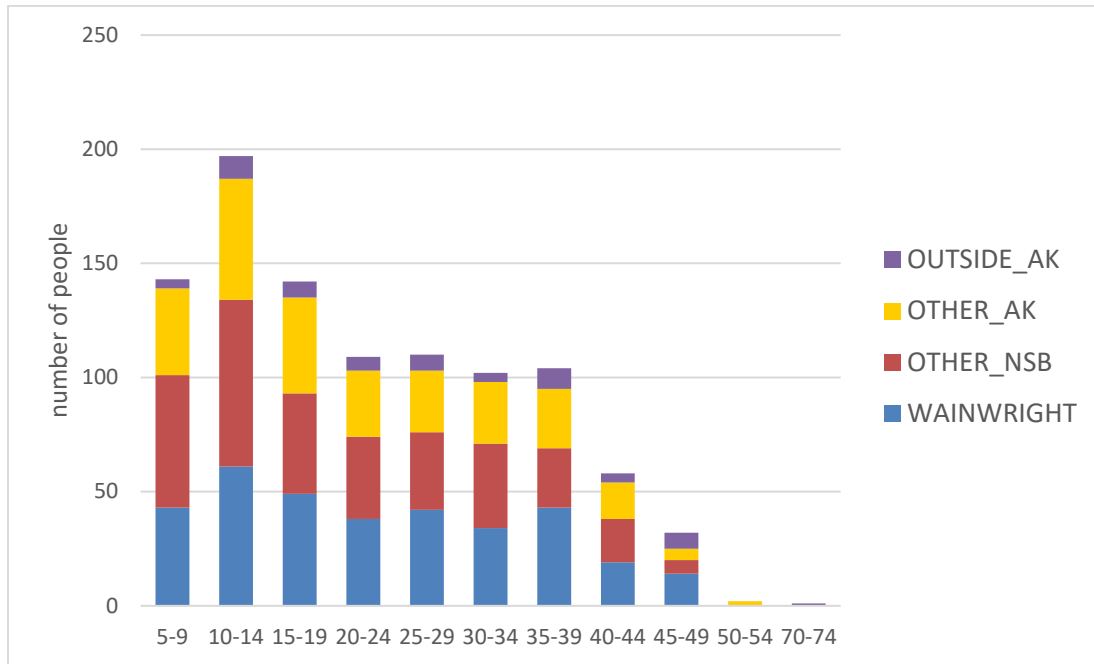


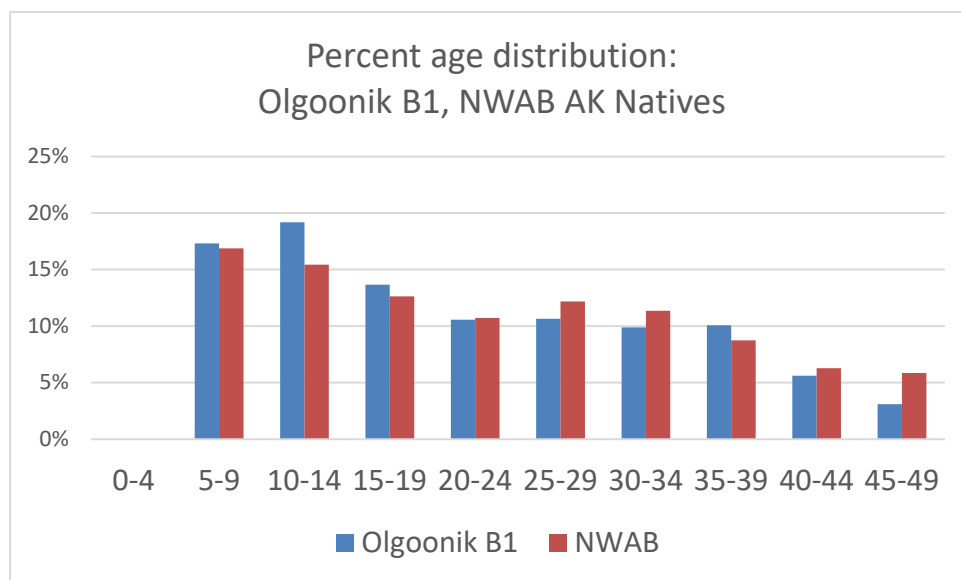
Table 1. Location of existing (B1) shareholders by age cohort

Row Labels	WAINWRIGHT	OTHER_NSB	OTHER_AK	OUTSIDE_AK	Grand Total
5-9	43	58	38	4	143
10-14	61	73	53	10	197
15-19	49	44	42	7	142
20-24	38	36	29	6	109
25-29	42	34	27	7	110
30-34	34	37	27	4	102
35-39	43	26	26	9	104
40-44	19	19	16	4	58
45-49	14	6	5	7	32
50-54	0	0	2	0	2
70-74	0	0	0	1	1
Grand Total	343	333	265	59	1000

Estimated backlog of B2 children born after 2/25/2014

The next step in the analysis is to estimate the backlog group of B2 descendants born after 2/25/14 and alive on 1/1/2020. First, I estimated the size of the 0-4 year cohort of descendants based on the size of the other cohorts. This estimate is based on the age distribution of the Alaska Natives in the Northwest Arctic Borough.^{2,3} Figure 2 shows that the match between Olgoonik and the NWAB is very good.

Figure 2. Age distribution of B1 shareholders compared to Northwest Arctic Borough Alaska Natives



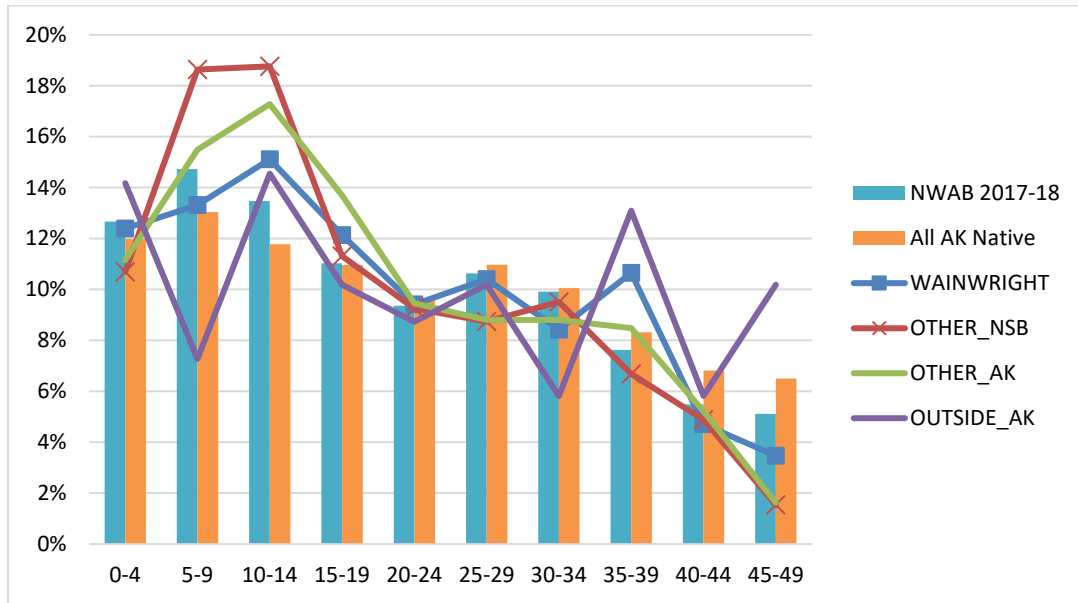
A further step is to add in the estimated number of 5-year olds, almost all of whom were born after 2/25/2014.⁴ The end result is an estimated backlog of 171 people as of 1/1/2020. Figure 3 shows the resulting estimated age distributions of living Olgoonik B1 and B2 descendants, by location and compared to both the Northwest Arctic Borough Alaska Native population and the statewide Alaska Native population.

² The estimated age distribution of Alaska Natives in the NWAB is from the Alaska Department of Labor. <http://live.laborstats.alaska.gov/pop/estimates/data/AgeBySexByRaceAloneHispBCA.xls> . The latest data, for 2017 and 2018 were averaged. I then calculated took the ratio of age 0-4 to the sum of ages 20-49 for NWAB. That ratio equals 0.2633. Finally, I applied that ratio to the known sum of ages 20-49 for the Olgoonik B1 population. The result is: $0.2633 \times 515 = 136$

³ I also considered using the North Slope Borough, but determined that the NWAB provides a better match.

⁴ The number of 5-yr olds is estimated as $\frac{1}{4}$ x the known Olgoonik B1 “5-9 cohort,” which actually consists almost entirely of people age 6-9.

Figure 3. Age distributions of living B1 and B2 Olgoonik descendants, compared to NWAB and to all AK Natives in Alaska



Projected future descendants ignoring blood quantum

With these building blocks in place, I used a standard demographic model similar to the one used for previous analyses of Olgoonik and other Native corporation descendants. January 1, 2020 is the start date for the projections. On this date, essentially all existing (B1) descendants are age 6.00 or higher.

Birth rates and death rates. I obtained the latest data (2016-18) on births and birth rates for the North Slope Borough.⁵ I used death rates by age and gender for the NSB for years 2011-13. These are the most current published death rates.

Births to descendant males partnered with non-descendant females. Standard population models account for births by focusing on females and using the following equation:

$$\begin{aligned} & \# \text{ of descendant women of a specific age} \\ \times & \text{ the fertility rate for women of that age} \\ \text{equals} & \text{ expected number of births to women of that age} \end{aligned}$$

Males are ignored by the model because males do not bear children. However, for the situation of a native corporation tracking descendants, the model must also consider

⁵ Alaska Vital Statistics.
http://dhss.alaska.gov/dph/VitalStats/Documents/stats/birth_statistics/births_age_group/frame.html

male descendants who have children with women who **not** descendants. When this happens, the nondescendant woman is, effectively, added to the population of female descendants for the purpose of projecting births. A child born to this type of couple is accounted for in the model as:

- (1) a descendant **male**
- x (2) the probability that he will have a nondescendant partner
- x (3) the fertility rate of his partner

Table 2 shows the current proportions of existing male B1 shareholders who have non-shareholder spouses or partners. These proportions are used as the probabilities in the model to project births to descendant males partnered with nondescendant females.

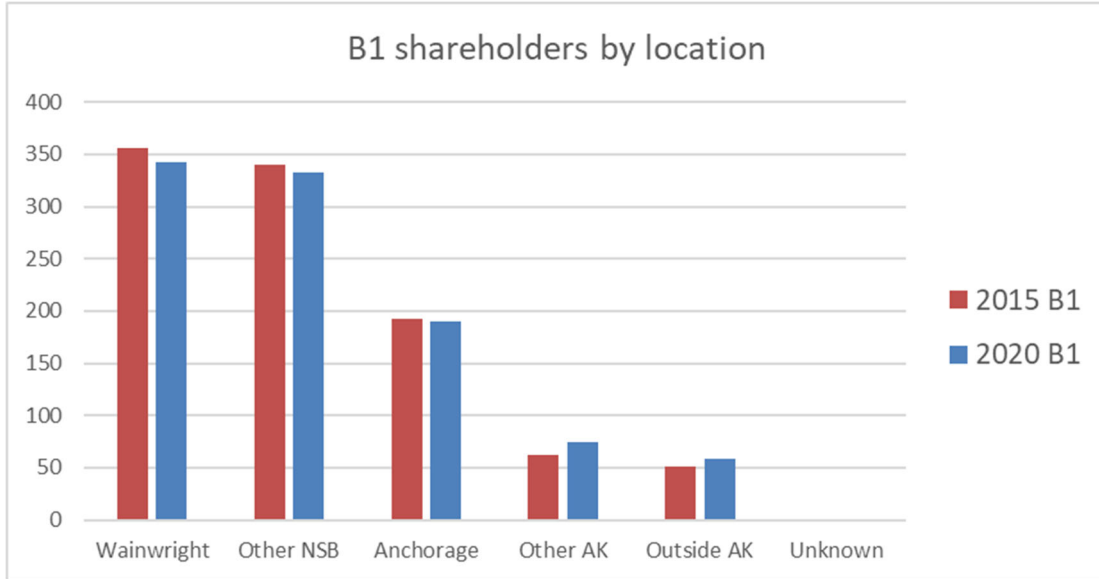
Table 2. proportion of male B1 shareholders who have non-shareholder spouses or partners, by age cohort and location

Age:	Overall	WAINWRIGHT	OTHER_NSB	OTHER_AK	OUTSIDE_AK
15-19	0%	0%	0%	0%	0%
20-24	1%	0%	4%	0%	0%
25-29	3%	0%	6%	7%	0%
30-34	20%	13%	44%	8%	0%
35-39	15%	12%	17%	22%	0%
40-44	19%	4%	80%	25%	20%

Shifts in location. I assumed that each location is a self-contained subpopulation. In other words, the projections do not forecast any shifts among locations. This assumption is based on comparing the location distribution of the 2015 shareholder database to the 2020 version. Figure 4 shows this comparison.⁶

⁶ There does seem to be a slight drift away from the North Slope, but due to the recession that was going on during most of the 2015-2020 period and due to general uncertainty, I think it is best to take account of this possible shift as a qualitative factor that can be applied when looking at the numerical projections.

Figure 4. Location of B1 shareholders in 2015 and 2020



Projection results

Over the next 30 years, the total population of living descendants increases by 1,226, from 1,171 on January 1, 2020 to 2,397 at the start of 2050. This increase is due to 1,384 births less 159 deaths during the period.

Figure 5 and Figure 6 show these results by location. Then, Tables 3 through 7 provide the annual figures.

Figure 5. Total descendants (B1 + B2) by location

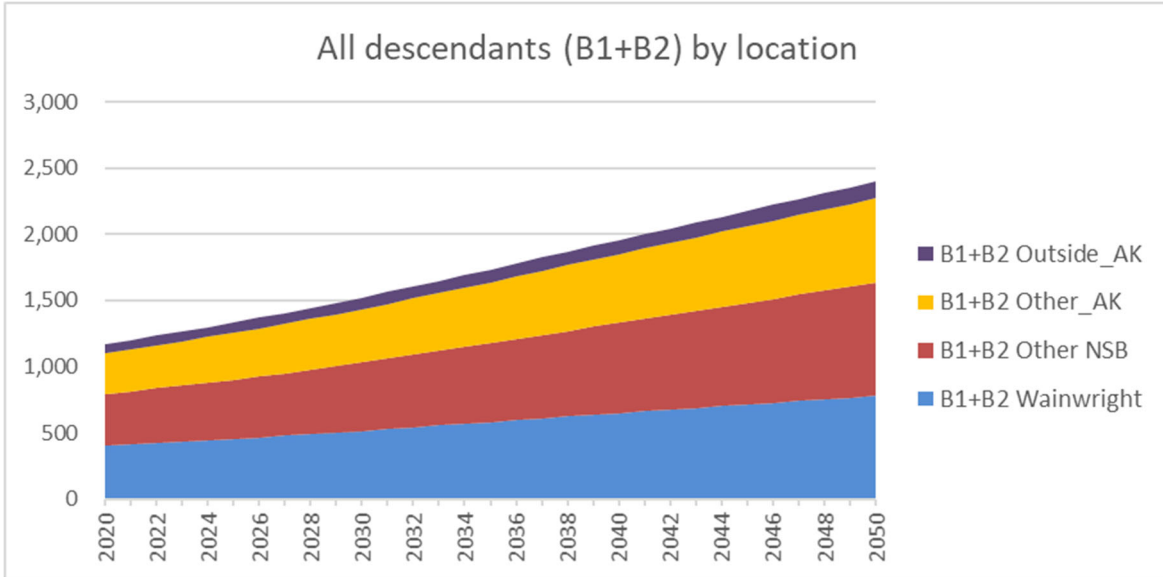
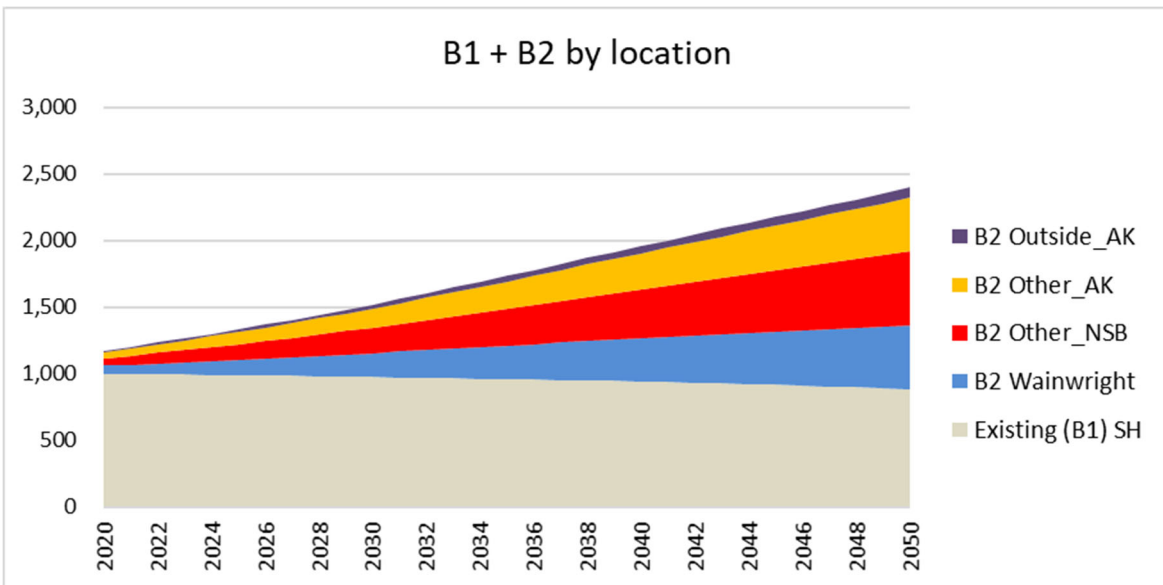


Figure 6. B1 descendants plus B2 by location



**Table 3. Projected descendants and components of change
All locations
2020 through 2050**

New (B2) Descendants

Total All Locations

	Jan 1:										
	2020	2021	2022	2023	2024	2025	2030	2035	2040	2045	2050
B2 population start of yr:	171	204	238	272	308	344	545	775	1,015	1,260	1,512
plus births (to B2 and B1)	33	34	35	36	37	38	45	49	50	52	55
less deaths	0	0	1	1	1	1	1	1	2	2	3
= B2 population end of yr	204	238	272	308	344	381	589	823	1,064	1,310	1,564
B2 change from 1/1/2020	33	66	101	136	173	210	418	651	893	1,138	1,392

Existing (B1) Shareholders

Total All Locations

	2020	2021	2022	2023	2024	2025	2030	2035	2040	2045	2050
B1 population start of yr:	1,000	998	996	994	991	989	976	960	942	918	885
less deaths	2	2	2	2	2	2	3	3	4	6	8
= B1 population end of yr	998	996	994	991	989	987	973	957	937	912	877
B1 change from 1/12020	(2)	(4)	(6)	(9)	(11)	(13)	(27)	(43)	(63)	(88)	(123)
B1 life estate shares retired (cum)	202	413	630	855	1,091	1,336	2,709	4,318	6,267	8,769	12,286
Total Descendants (B2+B1) start of yr	1,171	1,202	1,234	1,266	1,299	1,333	1,521	1,735	1,957	2,178	2,397
Total Descendants (B2+B1) end of yr	1,202	1,234	1,266	1,299	1,333	1,368	1,562	1,779	2,001	2,222	2,441
Cumulative births as of start of yr		33	67	102	139	175	380	615	864	1,119	1,384
Cumulative deaths as of start of yr		2	5	8	11	14	31	52	79	113	159

**Table 4. Projected descendants and components of change
Wainwright
2020 through 2050**

New (B2) Descendants

WAINWRIGHT	Jan 1:										
	2020	2021	2022	2023	2024	2025	2030	2035	2040	2045	2050
B2 population start of yr:	61	71	81	92	103	115	179	252	326	399	476
plus births (to B2 and B1)	10	11	11	11	12	12	14	15	15	16	17
less deaths	0	0	0	0	0	0	0	0	1	1	1
= B2 population end of yr	71	81	92	103	115	127	194	267	340	414	491
B2 change from 1/1/2020	10	20	31	43	54	66	133	206	280	353	431

Existing (B1) Shareholders

WAINWRIGHT	2020	2021	2022	2023	2024	2025	2030	2035	2040	2045	2050
B1 population start of yr:	343	342	342	341	340	339	335	329	323	314	302
less deaths	1	1	1	1	1	1	1	1	2	2	3
= B1 population end of yr	342	342	341	340	339	338	334	328	321	312	299
B1 change from 1/12020	(1)	(1)	(2)	(3)	(4)	(5)	(9)	(15)	(22)	(31)	(44)
B1 life estate shares retired (cum)	72	145	220	298	380	465	938	1,497	2,186	3,085	4,391
Total Descendants (B2+B1) end of yr	413	423	433	443	454	465	527	595	661	726	791

**Table 5. Projected descendants and components of change
Other NSB
2020 through 2050**

New (B2) Descendants

OTHER_NSB	Jan 1:										
	2020	2021	2022	2023	2024	2025	2030	2035	2040	2045	2050
B2 population start of yr:	56	68	80	93	105	118	191	277	368	461	557
plus births (to B2 and B1)	12	12	13	13	13	14	17	19	19	20	21
less deaths	0	0	0	0	0	0	0	1	1	1	1
= B2 population end of yr	68	80	93	105	118	132	208	295	387	480	577
B2 change from 1/1/2020	12	24	37	49	62	76	152	239	330	424	521

Existing (B1) Shareholders

OTHER_NSB	2020	2021	2022	2023	2024	2025	2030	2035	2040	2045	2050
B1 population start of yr:	333	332	332	331	330	330	326	321	315	308	298
less deaths	1	1	1	1	1	1	1	1	1	2	2
= B1 population end of yr	332	332	331	330	330	329	325	320	314	306	296
B1 change from 1/12020	(1)	(1)	(2)	(3)	(3)	(4)	(8)	(13)	(19)	(27)	(37)
B1 life estate shares retired (cum)	62	126	192	260	333	409	840	1,346	1,945	2,698	3,726
Total Descendants (B2+B1) end of yr	400	412	424	436	448	461	533	615	700	786	872

**Table 6. Projected descendants and components of change
Other Alaska (outside NSB)
2020 through 2050**

New (B2) Descendants

OTHER_AK	Jan 1:											
	2020	2021	2022	2023	2024	2025	2030	2035	2040	2045	2050	
B2 population start of yr:	44	53	62	72	82	92	145	205	269	335	403	
plus births (to B2 and B1)	9	10	10	10	10	10	12	13	14	14	15	
less deaths	0	0	0	0	0	0	0	0	0	1	1	
= B2 population end of yr	53	62	72	82	92	102	157	218	282	348	417	
B2 change from 1/1/2020	9	19	28	38	48	58	113	174	239	305	373	

Existing (B1) Shareholders

OTHER_AK	2020	2021	2022	2023	2024	2025	2030	2035	2040	2045	2050
B1 population start of yr:	265	264	264	263	263	262	259	255	250	244	236
less deaths	1	1	1	1	1	1	1	1	1	1	2
= B1 population end of yr	264	264	263	263	262	262	258	254	249	242	234
B1 change from 1/12020	(1)	(1)	(2)	(2)	(3)	(3)	(7)	(11)	(16)	(23)	(31)
B1 life estate shares retired (cum)	52	106	162	220	281	345	704	1,125	1,629	2,275	3,141
Total Descendants (B2+B1) end of yr	317	326	335	344	354	363	415	472	531	590	650

**Table 7. Projected descendants and components of change
Outside of Alaska
2020 through 2050**

OUTSIDE_AK	Jan 1:										
	2020	2021	2022	2023	2024	2025	2030	2035	2040	2045	2050
B2 population start of yr:	11	12	14	16	17	19	29	41	52	64	77
plus births (to B2 and B1)	2	2	2	2	2	2	2	2	3	3	3
less deaths	0	0	0	0	0	0	0	0	0	0	0
= B2 population end of yr	12	14	16	17	19	21	31	43	55	67	79
B2 change from 1/1/2020	2	3	5	7	9	10	21	32	44	56	68
Existing (B1) Shareholders											
OUTSIDE_AK	2020	2021	2022	2023	2024	2025	2030	2035	2040	2045	2050
B1 population start of yr:	59	59	59	58	58	58	57	56	54	52	49
less deaths	0	0	0	0	0	0	0	0	0	0	1
= B1 population end of yr	59	59	58	58	58	58	57	55	54	52	49
B1 change from 1/12020	(0)	(0)	(1)	(1)	(1)	(1)	(2)	(4)	(5)	(7)	(10)
B1 life estate shares retired (cum)	16	36	56	77	97	118	227	350	507	712	1,028
Total Descendants (B2+B1) end of yr	71	73	74	76	77	79	88	98	109	119	128

Comments on blood quantum

Figure 7 shows the distribution of blood quantum amounts among the existing B1 shareholders. Only 172 out of 980 (or about 18%) have BQ less than 0.5 and thus could potentially have offspring with BQ less than 0.25.

Furthermore, none of these 18% have a BQ less than 0.25. Thus a person in the 18% need only be partnered with someone whose BQ is at least 0.25 in order for their child to have BQ at least 0.25. Everyone in the Olgoonik B1 group meets this threshold.

The bottom line conclusion based on this initial look at the data is that a BQ restriction of 0.25 would have little effect on the next generation of descendants. However, the following generation, to be born beginning in the mid- to late 2030s, would likely have many people with BQ less than 0.25.

Figure 7. Blood quantum distribution among existing B1 shareholders

