

Alaska’s state government is sitting pretty today, with oil revenues at record levels, \$60 billion in savings including the Permanent Fund, and maybe another \$100 billion worth of petroleum in the ground. But clouds are looming: oil production is dropping, and state General Fund spending is climbing 8% a year.

Soon, a combination of smaller oil revenues and higher spending will leave a gap in the budget that other potential revenue sources won’t be able to fill. And if the state lets the budget keep growing at the current pace and covers the shortfall with savings, the easily available savings will be gone by 2023 and the deficit could reach \$7 billion a year.

There is another way the state could go: managing its remaining petroleum wealth for maximum sustainable yield—that is, set spending from petroleum wealth at a level that could be sustained indefinitely, benefitting both current and future Alaskans (see box).

Our current estimate of the state’s petroleum wealth is \$160 billion (\$60 billion in the bank and \$100 billion in petroleum in the ground). That could sustain spending of about \$6.4 billion a year, even with population growth.

But this year the state is expected to spend \$7.6 billion from petroleum wealth—so keeping that wealth intact will require some combination of spending cuts and new revenues amounting to \$1.2 billion a year.

That’s easier to say than to do, and other analysts could reasonably disagree about the current value of the state’s petroleum wealth and the sustainable level of spending.

But it’s critical for the state to develop a fiscal plan that will avoid a big fiscal and economic crisis in the near future—and preserve the state’s biggest asset for future generations. It has already made a start with the Permanent Fund and other savings accounts.

In this Web Note we discuss how the notion of maximum sustainable yield can help guide Alaska out of its fiscal dilemma.

#### **WHY MAXIMUM SUSTAINABLE YIELD?**

Alaskans know that to guarantee the size of the salmon harvest in future years, we have to forego some current consumption and let a few salmon escape upriver to spawn. We can think of this as an investment, producing a future return equal to that enjoyed by the current generation.

Unlike the salmon that return every year, oil is a finite resource that will eventually disappear. But by converting the revenues it generates into financial accounts and other investments, we can make it a sustainable resource supporting prosperity and jobs in perpetuity. Those perpetual benefits come from the annual earnings and other returns the accounts and other investments earn.

In the salmon fishery, maximum sustainable yield is based on determining the escapement needed to produce the largest possible sustainable harvest. For our oil resource, maximum sustainable yield would be based on determining how much we need to save to produce the largest possible sustainable flow of earnings and other returns.

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### **The Record of Saving of Petroleum Revenues**

Alaskans created the Permanent Fund in 1977, to save a share of non-sustainable oil revenues for the needs of future generations. A provision was added to the state constitution, mandating that 25% of the royalties from state-owned oil be deposited in the new fund. Those mandated deposits amounted to about 10% of total petroleum revenues.<sup>i</sup> But total saving has been about 26% of petroleum revenues, because of special contributions the legislature made to the Permanent Fund, as well as deposits in two other financial accounts that were created more recently—the Statutory Budget Reserve and the Constitutional Budget Reserve.

These financial accounts<sup>ii</sup> together now contain about \$60 billion. The constitution prohibits spending the principal of the Permanent Fund, but the other accounts, which now contain about \$18 billion of the total \$60 billion, were created to be used whenever there is a budget deficit. With petroleum revenues on a downward trend because of falling oil production, the question is whether this level of savings has been enough to sustain the prosperity the current generation has enjoyed from petroleum.

These accounts could potentially generate between \$2 billion and \$3 billion in sustainable earnings in perpetuity. But that would only pay for about one-quarter to one-third of the current state General Fund budget of \$7.6 billion. And in any case, the Permanent Fund produces most of these earnings; some of the earnings of that fund are used to pay for annual Permanent Fund dividends, but they have so far been politically unavailable to pay for general government.

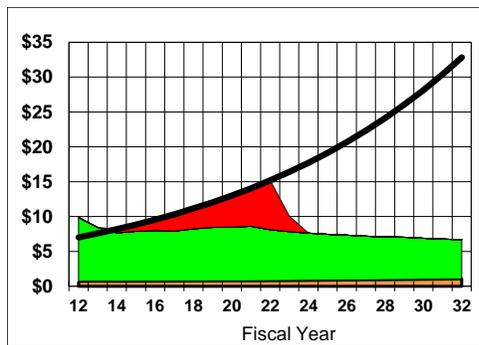
**Business As Usual Puts Us in a Dilemma**

The balances in these savings accounts suggest, incorrectly, that the state is in a strong fiscal position. General Fund spending has been growing at an annual rate of 8%, and petroleum revenues will inevitably decline as production continues to trend downward. The state budget will soon be in deficit, and these savings accounts will be needed to fill the gap.

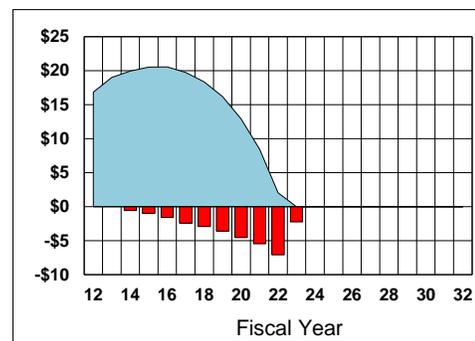
How long the savings last will depend on how fast spending grows and how quickly revenues fall. For example, Figure 1 shows a “Business as Usual” case. On the left, General Fund spending (black line) continues to grow at the historical rate of 8% each year. Oil revenue (green), as projected by the Alaska Department of Revenue, slowly trends downward, as production drops 2% per year and the oil price hovers around \$115 per barrel. Non-petroleum revenues (orange) make only a marginal contribution to revenues. If the Constitutional Budget Reserve and the Statutory Budget Reserve are used to offset the deficit (red) starting in 2014, they are gone by 2023, when the deficit has grown to \$7 billion.

**Figure 1. Business As Usual**

**General Fund Spending and Revenues**



**Balance in Constitutional Budget and Statutory Reserve Accounts**



The right side of Figure 1 tracks the balances in the reserve accounts (light blue). It shows the total in those accounts growing for the first few years, because the draw to cover the deficit (red) is small. But as the draw increases, the balance quickly falls to zero.

Clearly we have not saved enough to continue spending at the rate to which we have become accustomed. “Business as usual” would only be a viable fiscal option for the state if some new revenue source came along to replace oil revenues, or if General Fund spending fell dramatically.

**New Revenue Possibilities: Gas or OCS Are Not Enough**

Revenue from North Slope natural gas is usually suggested as a replacement for oil revenue. At best, a pipeline could begin to deliver that gas to market in 2023, just when the savings accounts have been used up. Figure 1 shows that about \$7 billion in annual gas revenues would be then be needed to avoid a deficit—which would require state revenues from gas of about \$5 for every MCF of gas produced.<sup>iii</sup> That might be possible, but trends in the world gas market have been putting downward pressure on gas prices for several years. In fact, the current market price for gas in the Lower 48 is between \$3 and \$4 per MCF.

More recently, some people have suggested that state sharing of federal OCS (Outer Continental Shelf) revenues from production offshore in the Beaufort and Chukchi seas could replace state oil revenue. A recent analysis estimated those revenues could be as much as \$53 billion over the next 50 years.<sup>iv</sup> That averages out to just over \$1 billion per year. But under current law, the state would not share in any of the federal revenues collected from OCS production.

If these new revenue sources do not materialize, it's at least conceivable that Alaskans would open the Permanent Fund to spending—but even that multi-billion fund could only fill the “business as usual” gap for a few years before it too was gone.

### **The Hard Reality: Spending Is Too High and Growing Too Fast**

Even in the best of circumstances, if the state did collect reasonable revenues from a gas pipeline and it was able to get a share of OCS revenue, the “business as usual” fiscal option is not sustainable. Growing spending will always overtake revenues, and savings will never be large enough to permanently offset deficits.

The only option is to adjust the size of the General Fund budget downward, to reflect the revenue generating capacity of the economy.<sup>v</sup>

Unfortunately, we currently have no guideline for assessing how big this downward adjustment needs to be, because we do not have a good estimate of the total “owner state” wealth from petroleum. Without that, it's not possible to know how much we are overspending today.

But the amount of overspending today also depends on how we choose to share our petroleum wealth with future generations. If it is fair that the current generation gets greater benefits from petroleum wealth than future generations, then we may in fact not be overspending after all. But before making that determination, we should be aware of the size of the fiscal burden (lower spending or higher taxes or both) that more spending today would impose on future generations of Alaskans.

How then can we set spending, which today is funded almost entirely from petroleum-related revenues, at a level that provides the highest possible benefit and is done in a way that is fair to all generations of Alaskans—current and future?

### **Maximum Sustainable Yield: Fairly Sharing the Petroleum Wealth**

There is no straightforward answer to that question, but the concept of maximum sustainable yield can provide a framework for thinking about what the answer can be, and so help guide fiscal policy in a direction away from the current dilemma. Developing a maximum sustainable yield strategy would force us to estimate the total petroleum wealth of the “owner state” and then decide how that wealth should be shared among the “owners.”

If maximum sustainable yield were implemented, spending from total petroleum wealth today would be constrained to a level that would ensure future generations would receive their share of its benefits. The following example discusses how that would work. See Appendix A for a summary and worksheet.

### **Example: “Owner State” Petroleum Wealth**

The value of the petroleum wealth held by Alaskans as the “owner state” consists not only of the \$60 billion in the Permanent Fund and other financial accounts, but also the revenues yet to be collected from future production of oil and gas. A rough estimate of these yet to be collected revenues, if they could all be “banked” today, is about \$100 billion.<sup>vi</sup> This estimate starts with

the Alaska Department of Revenue's 10-year projection and extends it to 2050, adding in revenues for gas sales, unconventional oil, and OCS production (but no OCS revenue sharing or production from ANWR). Any revenues the state might collect after 2050 are excluded, since they have very little current value.

The combined estimate of petroleum wealth—money in the bank and petroleum in the ground—is \$160 billion.

**Example: An Allocation Rule for Who Gets to Share the Wealth**

How then should this wealth be shared among Alaskans?<sup>vii</sup> The choice of an allocation rule is a political rather than an economic decision that should be made by all the “owners” of the petroleum wealth, but until now no rule has been agreed upon or even discussed.

One simple allocation rule would be to spend an equal per-capita share of the earnings from the petroleum wealth each year. There are many other possible allocation rules but this one is easy to understand because it does not favor any individual or group over any other.

This allocation rule requires that we know how many “owners” will be sharing the wealth in future years. Population has been growing at about 1% annually, so the maximum sustainable yield using this allocation rule would need to take population growth into account in calculating the benefit per “owner.”

**Example: Maximum Sustainable Yield**

Petroleum wealth of \$160 billion could produce—after netting out inflation proofing and reinvestment to account for growth in the number of “owners”—annual sustainable earnings of \$6.4 billion<sup>viii</sup> that would increase each year with population and inflation, in perpetuity.<sup>ix</sup> Petroleum wealth would also grow at about 4% annually—the combined rate of inflation and population growth. Future generations of “owners” would benefit from the same real per capita wealth as the current generation and get a share of the annual earnings from petroleum wealth equal to that of the current generation.<sup>x</sup>

This estimate of the sustainable spending level from petroleum wealth includes the principal and earnings of the Permanent Fund—but we assume that the principal of the Permanent Fund continues to be constitutionally protected from spending.

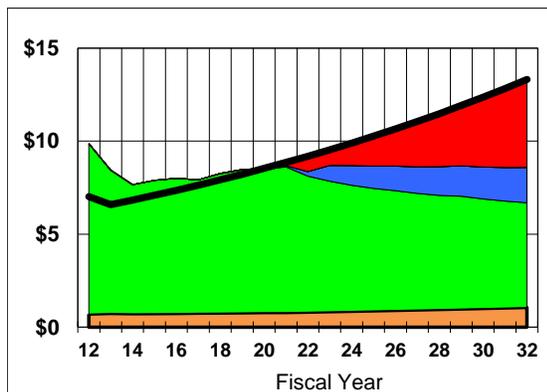
Figure 2 shows General Fund spending and revenues and balances in the Constitutional Budget and Statutory reserve accounts under a maximum sustainable yield strategy. In this example the current per capita Permanent Fund dividend continues to be paid out of the maximum sustainable yield of \$6.4 billion, leaving \$5.8 billion available for funding General Fund spending.

General Fund spending under such a strategy is shown as the solid line in the left diagram of Figure 2. Total General Fund spending would be \$6.4 billion in FY 2013, of which \$5.8 billion would come from petroleum revenues (green) and the rest from non-petroleum revenue sources (orange). Spending would grow at about 4% each year to accommodate population growth and offset inflation.<sup>xi</sup> In the early years, excess petroleum revenues would go into savings. Gas revenues at \$2 per MCF (blue) would replace some of the revenue loss from declining oil production. Eventually, the state would need to use some savings to supplement these revenues and avoid a deficit.

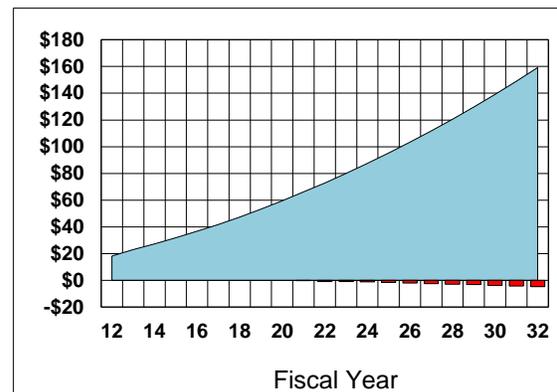
But in this case, the balances in the Constitutional Budget and Statutory Reserve accounts (light blue), shown on the right side diagram of Figure 2, keep growing at an annual rate that eventually evens out to about 4%. In the early years these balances grow faster because all earnings are reinvested, but later the earnings begin to supplement other revenues in the General Fund budget.<sup>xii</sup>

**Figure 2. Maximum Sustainable Yield**

**General Fund Spending and Revenues**



**Balance in Constitutional Budget and Statutory Reserve Accounts**



### Uncertainty

The “owner state” petroleum wealth calculation will always be a moving target, and at any time there will be reasonable differences of opinion about its current value. So it needs to be monitored and updated as new information becomes available. There will also be uncertainty about the rate of return this wealth can produce.

Table 1 shows that the 2013 spending level of \$6.4 billion—based on the maximum sustainable yield example (\$60 billion in financial reserves, \$100 billion of petroleum wealth still to be produced, and a 5% real return on that wealth)—is sensitive to both the amount of wealth still in the ground and the real rate of return on that wealth.<sup>xiii</sup>

**Table 1. Sensitivity of Annual Earnings to Wealth and Rate of Return  
Petroleum-Related Spending from (General and Permanent Funds) in FY2013**

		Maximum Sustainable Yield			
		Real Investment Return			
		3%	4%	5%	6%
Bankable Petroleum (Billion \$)	\$ 50	\$ 2.2	\$ 3.3	\$ 4.4	\$ 5.5
	\$ 60	\$ 2.4	\$ 3.6	\$ 4.8	\$ 6.0
	\$ 70	\$ 2.6	\$ 3.9	\$ 5.2	\$ 6.5
	\$ 80	\$ 2.8	\$ 4.2	\$ 5.6	\$ 7.0
	\$ 90	\$ 3.0	\$ 4.5	\$ 6.0	\$ 7.5
	\$ 100	\$ 3.2	\$ 4.8	<b>\$ 6.4</b>	\$ 8.0
	\$ 110	\$ 3.4	\$ 5.1	\$ 6.8	\$ 8.5
	\$ 120	\$ 3.6	\$ 5.4	\$ 7.2	\$ 9.0
	\$ 130	\$ 3.8	\$ 5.7	\$ 7.6	\$ 9.5
	\$ 140	\$ 4.0	\$ 6.0	\$ 8.0	\$ 10.0
	\$ 150	\$ 4.2	\$ 6.3	\$ 8.4	\$ 10.5
	\$ 160	\$ 4.4	\$ 6.6	\$ 8.8	\$ 11.0
	\$ 170	\$ 4.6	\$ 6.9	\$ 9.2	\$ 11.5
	\$ 180	\$ 4.8	\$ 7.2	\$ 9.6	\$ 12.0
	\$ 190	\$ 5.0	\$ 7.5	\$ 10.0	\$ 12.5
	\$ 200	\$ 5.2	\$ 7.8	\$ 10.4	\$ 13.0
	Assumptions				
Initial Financial Asset Balance				\$	60
GF Spending Growth PC					0%
Population Growth					1%

Because more than a third of the petroleum wealth has already been converted into financial assets, the value of which is known and relatively stable, a large change in the estimate of bankable petroleum wealth (petroleum revenues still in the ground) has only a modest effect on the maximum sustainable yield. Maximum sustainable yield is more sensitive to the real rate of return on wealth.

### Dealing with Risk

In dealing with this uncertainty we should consider the consequences of an incorrect estimate of the earnings power of the petroleum wealth. If the estimate is too high, current spending would be too high to sustain future spending at levels fair to the next generation. But if the estimate is too low, we will save more than necessary to pass a fair share to the next generation.

There is no straightforward rule to apply to make a risk adjustment. Like the allocation rule for sharing, this is a political decision based upon how much risk the “owners” feel comfortable taking on. But it is important to recognize that without such an adjustment there is a 50% chance that the estimate will turn out to be too high.

In deciding how much risk is appropriate, it is also important to consider the potential fiscal burden passed on to future generations—in higher taxes and lower spending—and the potential economic consequences of a recession induced by a big (and possibly sudden) drop in government spending.

### Shifting to the Maximum Sustained Yield Path

Spending from petroleum wealth in FY2013 is projected to be \$7.6 billion—about \$1.2 billion more than the maximum sustainable yield level of \$6.4 billion calculated in the example. This consists of \$7 billion of petroleum wealth spent through the General Fund (\$6.85 billion from current petroleum revenues and \$.18 billion from General Fund earnings), as well as \$.570 billion of spending from the Permanent Fund to pay for dividends.

Shifting to a maximum sustained yield path could be done through any combination of budget reductions and new non-petroleum revenue sources that summed to \$1.2 billion (assuming no reduction in the dividend).

This would leave the state with \$1.2 billion of additional surplus oil revenue to be saved in the financial reserve accounts. In subsequent years there would also be larger surpluses that would increase the size of the savings accounts as the oil in the ground was depleted.

### Making Maximum Sustained Yield Work

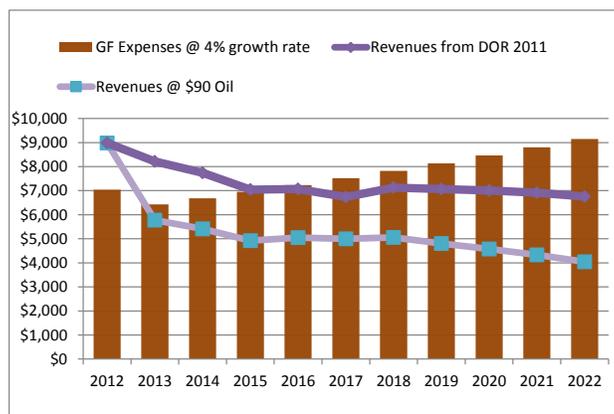
Although it is easy to describe a maximum sustainable yield fiscal plan, there are obvious challenges to making it work. Perhaps the most daunting is the need to manage large and growing financial accounts.

But Alaska already has \$60 billion of financial reserves, and Norway, with a savings account of about \$600 billion, shows that it is possible to convert a large share of a non-sustainable resource into sustainable financial resources. Alaska could target and with discipline achieve a balance of \$100 billion in financial accounts (including the Permanent Fund) by 2020.

### The Current 10-Year Alaska Fiscal Plan

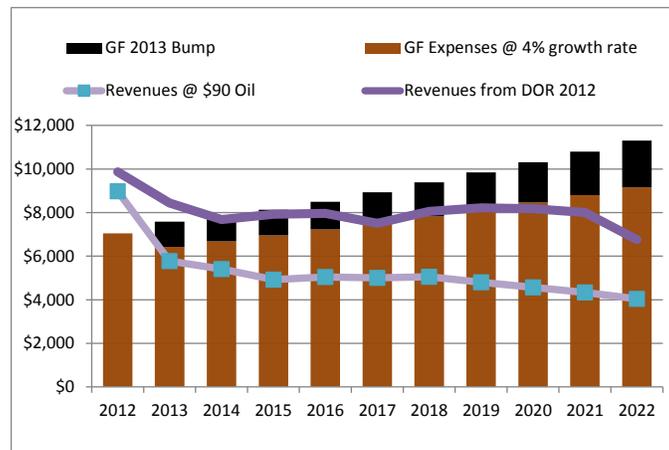
The FY2013 OMB (Office of Management and Budget) fiscal plan shows General Fund expenditures quickly overtaking revenues if spending were to grow at only 4% a year.<sup>xiv</sup> The plan assumes the resulting deficits would be covered by reserve funds until gas revenues replaced falling oil revenues sometime after 2022.<sup>xv</sup>

**Figure 3. SUMMARY: OMB FY2013 10-Year Fiscal Plan**



Since that plan came out, in December 2011, the Department of Revenue (DOR) has published more optimistic revenue projections—but at the same time the FY2013 budget was bumped up by \$500 million. Spending still quickly overtakes revenues.

**Figure 4. UPDATE: OMB FY2013 10-Year Fiscal Plan  
After the plan was published (December 2011)**



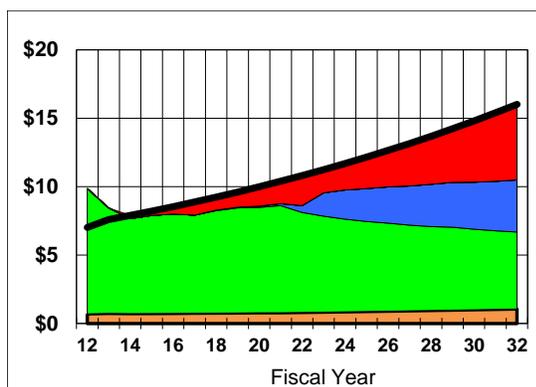
**The State Fiscal Plan—What Happens After 2022?**

What happens if we extend the fiscal plan spending trend out for a decade to 2032, extend oil revenues through that decade, and add gas revenues (\$2 per MCF) from a 4.5 BCF pipeline coming on line as soon as possible, in 2022?

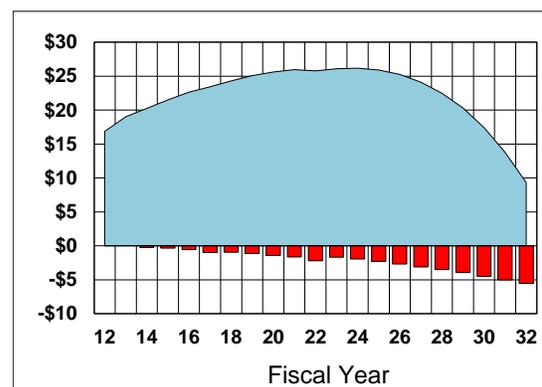
Gas revenues are insufficient to replace falling oil revenues, and the savings accounts are needed continuously to prevent deficits. This strategy works temporarily, but the savings accounts eventually disappear.

**Figure 5. The State Fiscal Plan Extended**

**General Fund Spending and Revenues**



**Balance in Constitutional Budget and Statutory Reserve Accounts**



Extending the time frame and highlighting the balances in the savings accounts demonstrates the inadequacy of the current state fiscal plan and the need to re-craft it to take into account the long-term revenue generating capacity of state resources.

APPENDIX A

<b>PETROLEUM WEALTH MANAGEMENT WORKSHEET</b>		
<b>PETROLEUM WEALTH</b>		Billion \$
1	Permanent Fund Balance	\$ 42.00
2	+ Constitutional Budget Reserve	\$ 16.00
3	+ Statutory Budget Reserve	\$ 2.00
4	+ Other	\$ -
5	<b>= Financial Assets</b>	<b>\$ 60.00</b>
6	Conventional North Slope--State Lands	\$ 72.00
7	DOR projection	\$ 50.00
8	DOR extended	\$ 22.00
9	+ Other Oil	\$ 16.00
10	Conventional	\$ 7.00
11	Non-Conventional (Heavy Oil/Shale Oil)	\$ 8.00
12	OCS	\$ 1.00
13	ANWR	\$ -
14	+ Gas	\$ 12.00
15	<b>= Petroleum in Ground (Net Present Value)</b>	<b>\$ 100.00</b>
16	<b>= TOTAL PETROLEUM WEALTH (5+15)</b>	<b>\$ 160.0</b>
<b>SUSTAINABLE RATE OF RETURN</b>		Annual Rate
17	Real Rate of Return Net of Inflation	5.0%
18	- Population Growth Adjustment	1.0%
19	<b>= SUSTAINABLE RATE OF RETURN (17-18)</b>	<b>4.0%</b>
<b>MAXIMUM SUSTAINABLE YIELD (MSY)</b>		Billion \$
20	Preliminary Yield (16 x 19)	\$ 6.40
21	- Risk Adjustment ( +/-)	\$ -
22	<b>= RISK ADJUSTED MAXIMUM SUSTAINABLE YIELD (20-21)</b>	<b>\$ 6.40</b>
<b>GENERAL FUND MSY SPENDING CAP</b>		Billion \$
23	Risk Adjusted Maximum Sustainable Yield (=22)	\$ 6.40
24	- Permanent Fund Dividend Distribution	\$ 0.60
25	<b>= General Fund Petroleum Spending Cap</b>	<b>\$ 5.80</b>
26	- General Fund Earnings Spending (from Petroleum Wealth)	\$ 0.20
27	<b>= GENERAL FUND CURRENT PETROLEUM REVENUE SPENDING CAP</b>	<b>\$ 5.60</b>
28	+ Non-Petroleum General Fund Revenues	\$ 0.60
29	<b>= GENERAL FUND MSY SPENDING CAP (26+27+28)</b>	<b>\$ 6.40</b>
30	<b>ACTUAL FY 2013 GENERAL FUND APPROPRIATIONS</b>	<b>\$ 7.60</b>
31	<b>FY2013 OVERSPEND=EXCESS BURDEN (30-29)</b>	<b>\$ 1.20</b>

<sup>i</sup> Total petroleum revenues include income, production, and property taxes as well as royalties.

<sup>ii</sup> The General Fund also contains unexpended funds.

<sup>iii</sup> A pipeline with the capacity to transport 4.5 BCF of gas a day would move 1,642 BCF per year (4.5x365). Each \$1 of revenue per MCF would consequently produce \$1.6 billion for the state.

<sup>iv</sup> “Potential National-Level Benefits of Alaska OCS Development” by Northern Economics and the Institute of Social and Economic Research, University of Alaska, for Shell Exploration and Production, February 2011. This study estimates federal lease payments from Alaska OCS could be \$140 billion over the next 50 years at \$100/barrel oil. If the state received a 37.5% share, similar to the Gulf of Mexico states, the state would collect \$52.5 billion.

<sup>v</sup> A personal income tax and a general sales tax at rates comparable to other states could generate about \$1.25 billion annually.

<sup>vi</sup> See table 3 in “Managing Alaska’s Petroleum Nest Egg for Maximum Sustainable Yield”, Web Note 10, March 2012 by Scott Goldsmith, Institute of Social and Economic Research, University of Alaska Anchorage.

<sup>vii</sup> The creation of the Permanent Fund indicates Alaskans have some allocation rule in mind, but a specific rule was has never been discussed.

<sup>viii</sup> All the financial reserve accounts are invested to earn a real return of 5%--similar to the Permanent Fund.

<sup>ix</sup> This assumes a nominal return of 7.75%, inflation proofing of 2.75%, and reinvestment of 1% to offset population growth. The net return available for distribution is then 4%.

<sup>x</sup> \$8,700 per capita.

<sup>xi</sup> Spending could be higher, but would need to be paid with new non-petroleum revenues.

<sup>xii</sup> In this case the Permanent Fund dividend is held constant in real per capita terms at the current level and the rest of the earnings of the Permanent Fund, net of inflation proofing, is added to the savings accounts.

<sup>xiii</sup> This table also can be used to show that the results are very sensitive to the rate of population growth. For example if the population growth rate is 0% (2%) every value in the table would increase (decrease) by 25%.

<sup>xiv</sup> The Office of Budget and Management FY2013 10-Year Plan.

<sup>xv</sup> Revenues are based on the Fall 2012 Department of Revenue projection.