SB 147

<TARGET><BILL>SB 147</BILL><SUBJECT>SB 147</SUBJECT><COMM>SCRA27</COMM></TARGET>

ALASKA STATE LEGISLATURE
Senator Albert M. Kookesh

State Capitol, Room 7
Juneau, Alaska 99801-1182

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E-mail: Senator_Albert_Kookesh@legis.state.ak.us

Standing Committees:
Transportation
Community & Regional Affairs

DISTRICT C

Alatna
Allakaket
Aniak
Angoon
Anvik
Arctic Village
Beaver
Beluga
Bettles
Big Delta
Birch Creek
Boundary
Cape Pole
Central
Chalkyitsik
Chandalar Lake
Chenega Bay
Chicken
Chisana
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Chitina
Chuathbaluk
Circle
Coffman Cove
Cordova
Cube Cove
Coldfoot
Copper Center
Craig
Crooked Creek
Delta Junction
Deltana
Dot Lake
Dry Creek
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Eagle Village
Edna Bay
Ellamar
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Excursion Inlet
Eureka
Evansville
Eyak
Flat
Fort Greely
Fort Yukon
Fortuna Ledge
Funter Bay
Gakona
Galena
Grayling
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Gustavus
Haines
Healy Lake
Hogatza
Hobart Bay
Holy Cross
Hoonah
Hughes
Huslia
Hydaburg

Hyder
Kake
Kaltag
Kasaan
Katalla
Kennicott
Kenny Lake
Klawock
Klukwan
Koyukuk
Labouchere Bay
Lake Minchumina
Lime Village
Livengood
Long Island
Mankomen Lake
Manley Hot Springs
Marshall
McCarthy
McGrath
Medfra
Metlakatla
Mentasta
Minto
Nabesna
Naukati Bay
Nenana
Nikolai
Northway
Nulato
Ophir
Point Baker
Polk Inlet
Port Alice
Port Protection
Rampart
Red Devil
Ruby
Russian Mission
Shageluk
Skagway
Slana
Sleetmute
Stevens Village
Stony River
Strelna
Takotna
Tanacross
Tanana
Tatitlek
Tazlina
Telida
Tenakee Springs
Tetlin Junction
Tok
Tonsina
Tyonek
Utopia Creek
Venetie
View Cove
Waterfall
Whale Pass
Wiseman
Yakutat

February 2, 2012

The Honorable Donald Olson
Chair of the Senate Community & Regional Affairs Committee
State Capitol, Rm 508
Juneau, AK 99801

Dear Senator Olson:

I respectfully request a hearing for Senate Bill 147 "An act relating to an Alaska Water and Sewer Task Force." This bill will create a nine member task force to address the estimated 6,000+ homes in the state without safe potable water or safe sanitation systems. The task force shall, to the extent possible; establish a more accurate number of homes without safe water and sewer systems; establish a spectrum of need and prioritize; explore alternative simple self-sustaining water and sewer systems in small rural communities; research other arctic nations systems; coordinate funding and agencies that provide services and construct projects; investigate and assess past projects and service providers; and meet with state and federal agencies and departments on regulations and funding requirements to stream line projects.

Enclosed you will find the full text of Senate Bill 147, the sponsor statement and letters of support. Thank you for your consideration and if you have any questions please don't hesitate cotacting me personally or my staff Dorothy Shockley at 465.3018.

Sincerely,

Albert Kookesh
Senator

Enclosures

SENATOR ALBERT M. KOOKESH
ALASKA STATE LEGISLATURE SENATE DISTRICT C

State Capitol, Room 11
Juneau AK, 99801-1182
907-465-3473
888-288-3473
FAX 907-465-2827

Sponsor Statement
SB 147

SB 147 creates a nine member Alaska Water and Sewer Task Force to address the estimated 6,000+ homes in the state without safe potable water or safe sanitation systems. The State of Alaska has only met the required match of federal funds at 19 to 25% for rural projects and most of that money has not gone to new projects but facility upgrades and maintenance.

In April 2010 the Bush Caucus wrote a letter to the Governor requesting more funds for water and sewer projects with recommendations to improve the DEC Village Safe Water program: establish major construction and maintenance projects list like the Department of Education puts out; encourage the public and community to be more involved in the planning process; with federal and state planning and maintenance training funds meet with the community and select a project that is sustainable; work with the AK Native Science and Engineering Program to design water and sewer projects that will work in rural Alaska; and comply with federal reporting requirements in a timely manner. In January and December of 2011 our office followed up with additional letters requesting more funding to no avail.

We can no longer continue business as usual when so many of our neighbors are living in third world conditions. It is inexcusable to have such horrendous conditions in our state. Not to mention the health risks.

The task force shall, to the extent possible

- Establish a more accurate number of homes without safe water and sewer systems
- Establish a spectrum of need and prioritize
- Explore alternative simple self-sustaining water and sewer systems in small rural communities
- Research other arctic nations water and sewer systems
- Coordinate funding and agencies that provide services and construct water and sewer projects
- Investigate and assess past water and sewer projects and service providers
- Meet with state and federal agencies and departments on regulations and funding requirements to stream line projects.

The task force will hold public hearings and use other means to solicit as much helpful information as possible from the citizens of the state and submit the findings and recommendations to the legislature on January 31, 2012.

Association of Alaska Housing Authorities

Tlingit-Haida Regional Housing Authority
PO Box 32237
Juneau, Ak 99803-2234
907-780-6868

Interior Regional Housing Authority
828 27th Avenue
Fairbanks, Ak 99701-6918
907-452-8315

North Pacific Rim Housing Authority
8300 King Street
Anchorage, Ak 99518
907-562-1444

Cook Inlet Housing Authority
3510 Spenard Rd, Suite 201
Anchorage, Ak 99503-2745
907-276-8822

Aleutian Housing Authority
4000 Old Seward Hwy, Suite 202
Anchorage, Ak 99503
907-563-2146

Tagiugmiullu Nunamiullu Housing Authority
PO Box 409
Barrow, Ak 99723
907-852-7150

Bristol Bay Housing Authority
PO Box 50
Dillingham, Ak 99576-0050
907-842-5956

Copper River Basin Regional Housing Authority
PO Box 89
Glennallen, Ak 99588
907-822-3633

AVCP Regional Housing Authority
PO Box 767
Bethel, Ak 99559-0767
907-543-3121

Baranof Island Housing Authority
PO Box 517
Sitka, Ak 99835-0517
907-747-5088

Bering Straits Regional Housing Authority
PO Box 995
Nome, Ak 99762-0995
907-443-5256

Alaska Housing Finance Corporation
4300 Boniface Parkway
Anchorage, Ak 99504
907-338-6100

Kodiak Island Housing Authority
3137 Mill Bay Rd
Kodiak, AK 99615-7032
907-486-8111

Northwest Inupiat Housing Authority
PO Box 331
Kotzebue, Ak 99752-0331
907-442-3450

Ketchikan Indian Community
2960 Tongass Avenue
Ketchikan, Alaska 99901

January 12, 2012

Senator Albert Kookesh
State Capitol
Juneau, AK 99801

Dear Senator Kookesh:

The membership of the Association of Alaska Housing Authorities (AAHA) includes fourteen regional housing authorities and the Alaska Housing Finance Corporation. Alaska's regional housing authorities are the primary builders of new, affordable housing in rural Alaska and are a key producer of affordable housing in the state's urban centers.

We appreciated receiving your letter of December 6, 2011 in regards to your plans to increase attention on continuing unmet water and sewer needs in the state and develop strategies to constructively address these needs.

AAHA strongly supports your efforts to eradicate unhealthful drinking water and sanitation systems, which exist in many Alaskan communities.

We look forward to working with you on this initiative in any way possible, including participation on a potential state task force to find more effective ways to address this matter.

On behalf of our membership and the 15,000 individuals we serve, thank you for the proactive steps you are taking in this area.

Sincerely,

Dan Duame
Board President

Heather Arnett
Statewide Administrator

Association of Alaska Housing Authorities
4300 Boniface Pkwy.
Anchorage, AK 99504
99504
(907) 338-3970
aaha@alaska.net

c: Dorothy Shockley

Mary Schlosser

From: Dorothy Shockley
Sent: Friday, February 03, 2012 2:10 PM
To: Mary Schlosser
Subject: FW: Teller Water and Sewer

From: Noele Weemes [mailto:noeleweemes@yahoo.com]
Sent: Monday, January 16, 2012 11:24 AM
To: Dorothy Shockley
Subject: Teller Water and Sewer

I am responding to Senator Albert Kookesh's letter regarding water and sewer in Alaska. The village of Teller has approximately 80 homes without piped water and sewer. Teller uses a fill and draw system where water is drawn seasonally from a nearby creek and stored in a one million tank and treated at a plant. The City water truck hauls water to residents and residents haul their own water as well. The village uses honey buckets. Teller is one of the last villages in the Bering Strait Region to be without a suitable sanitation system. Residents are anxious to move beyond the honey bucket and the associated health hazards. Lack of an adequate water source and piped utilities has limited growth, hampered economic development opportunities, and adversely affected the health and quality of life of community residents. I am the grant writer for the Native Village of Teller and have currently written a IGAP proposal where community planning for water and sewer will be part of the work plan for FY13. Water and Sewer is Teller's #1 priority in Teller's Local Economic Development Plan.

Sincerely,
Noele Weemes

Mary Schlosser

From: Dorothy Shockley
Sent: Friday, February 03, 2012 2:11 PM
To: Mary Schlosser
Subject: FW: Suggestions?

From: Lilllian Gump [mailto:lillygump@gmail.com]
Sent: Thursday, January 12, 2012 9:13 AM
To: Dorothy Shockley
Subject: Suggestions?

Happy New Year Dorothy,
Hi! I would like to say the biggest "Thank You"! to Sen. Kokesh for someone to finally send or say something to our Governor concerning our water and sewer. It is true that people are shooting to the moon, while we are still trying to figure out how to address our honey bucket and health situation. There is progress here in our town but it is taking too long and the thing they cry about over and over is the money or grant. Twenty years is a long time to dream about me taking a hot bath in my own home or to never see my children or grandchildren to touch the honey bucket again or pack water in bad weather conditions.
There are still a lot of houses that are not hooked up at Hooper Bay and this has been going on for long,long years. Now they say that we might need to move our houses around to get water cause they are too close? The main problem is the money. I would suggest that you make sure that they dont get stuck on grants in the middle of projects that is taking forever. Also the weather conditions are a major factor so they need to get as much done in the summer before freeze up.
Thank you for listening to "The Real People" Sen. Kokesh!

Lillian Gump
IGAP Asst.

Mary Schlosser

From: Dorothy Shockley
Sent: Friday, February 03, 2012 2:12 PM
To: Mary Schlosser
Subject: FW: Letter from Senator Albert Kookesh

From: Robert Panruk [mailto:robert.panruk@gmail.com]
Sent: Wednesday, January 11, 2012 3:53 PM
To: Dorothy Shockley
Subject: Letter from Senator Albert Kookesh

Hello Dorothy,
I am Robert Panruk President of Chefarnrmute, Inc. in Chefornak, Alaska. I was born right here in Chefornak. I have lived all my life here
in exception to going High School and training out of village.
It has been 40 years since we were told we would be getting running water and flush toilets. To this date we have seen neither. Only thing
we got has been watering points with undrinkable water. Haul system for honey buckets. It has gone from about 20 houses at that time
to about 92 homes and about 7 municipal and business buildings. We still haul our own honey buckets and get our ice water during winter.
Rain water during summer. We are out looking for drinkable water when it hardly rains during summer. some don't have the means to do
that.
We definitely don't have safe water to drink and safe sanitation.

We definitely support Senator Albert Kooskesh's letter to form a task force that will look into alternative solutions that will help our villages
that have ben waiting a lifetime to get what was promised us. Most all our elders are gone before they even got to flush a toilet. And the
next ones will probably do the same unless something is done.
Company's that get our appropriated money have not found a solution to this day and it is all a waste of money
If you need to contact me you can at 907-867-8115.

Quyana,

Robert Panruk
President/General Manager
P.O. Box 70
Chefornak, Alaska 99561

Mary Schlosser

From: Dorothy Shockley
Sent: Friday, February 03, 2012 2:12 PM
To: Mary Schlosser
Subject: FW: 6,000 homes still without water and sewer in Alaska

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From: Kerry Boyd [mailto:kboyd@yksd.com]
Sent: Tuesday, January 10, 2012 8:02 AM
To: Dorothy Shockley
Subject: RE: 6,000 homes still without water and sewer in Alaska

Dear Dorothy,

Thank you for bringing this to the top. Please let the Senator know that I will be working with our YKSD communities to determine the numbers of families without water. I will try to get the information ASAP.

Kerry Boyd

From: Dorothy Shockley [mailto:Dorothy_Shockley@legis.state.ak.us]
Sent: Thursday, December 29, 2011 2:26 PM
Subject: 6,000 homes still without water and sewer in Alaska

Good Afternoon and Happy New Year!

If you would please take a moment and read the attached letter from Senator Kookesh and call email or write the Governor urging him to fully fund water and sewer projects throughout the state.

Thank you very much.

Mary Schlosser

From: Dorothy Shockley
Sent: Friday, February 03, 2012 2:13 PM
To: Mary Schlosser
Subject: FW: # of water & sewer homes-Golovin

From: Donna Brown [mailto:dbrown@kawerak.org]
Sent: Friday, January 06, 2012 3:43 PM
To: Dorothy Shockley
Cc: Sen. Albert Kookesh
Subject: # of water & sewer homes-Golovin

Hello Dorothy and Albert,

This is a responce your letter Chinik Eskimo Community, Native Village of Golovin Traditional Council recieved. Here in Golovin, we have 49 households with only 16 having water & sewer. The rest of the homes rely on honeybuckets or potable septic tanks.

We appreciate all the hard work you are doing, please contact our Tribal Coordinator Donna, should you have any questions at the number below or by responding to this email. Thank you, Happy New Year!

Donna Brown

Golovin Tribal Coordinator

P.O. Box 62020

Golovin, Alaska 99762

779-2214 Fax: 779-2829

~ ~ ~ ~hope faith love~ ~ ~ ~

Mary Schlosser

From: Dorothy Shockley
Sent: Friday, February 03, 2012 2:15 PM
To: Mary Schlosser
Subject: FW: rural water/ sewer issues

From: Organek, Jeff C (DOT) [mailto:jeff.organek@alaska.gov]
Sent: Thursday, December 15, 2011 4:00 PM
To: Dorothy Shockley
Cc: jefforganek@hotmail.com
Subject: RE: rural water/ sewer issues

Here is a snapshot of some of my experience:

In 2005 I drafted a report for the Corps of Engineers detailing potential damages that might be sustained in the City of Barrow in the event of a 20' storm surge. I studied their utilidoor and direct bury water distribution systems, their wastewater collection systems, sewage lagoon, water treatment plants, and other elements, and determined various emergency remedies to restore the systems after the surge event. Barrow actually has a complex assortment of different utility systems serving the community, so this was an interesting project. I was an employee of ASCG INC.

In 2005/ 2006 I conducted feasibility studies for the communities of Arctic Village and Stevens Village to determine various engineering options and associated costs to supply water and wastewater service to the villages. The reports considered numerous options, both high and low tech, that would achieve the goals. The client was Village Safe Water and I was an employee of ASCG INC.

In 2008/ 2009 I designed a class B water system (served by a well) and a non conventional wastewater system in Fairbanks Alaska. I performed design, obtained permits, and construction administration. The client was the FNSB, and I was employed by WHPacific (ASCG changed their name to WHPacific).

In 2009/ 2010 I designed a circulating water service and a wastewater service served by a lift station. This was a classic arctic utility design application. The client was the FNSB, and I was employed by WHPacific.

Although not directly related to water/ sewer design, I have traveled to the following communities while conducting transportation engineering designs; Stevens Village, Arctic Village, Venetie, Chalkyitsik, Kaktovik, Barrow, Anaktuvuk Pass, Nulato, Galena, Nome, Kotzebue, Kobuk, Ambler, Shungnak, Sellawik, and Deering. I have been to some of these villages many times. Through my contact with the villages I executed contracts with the Village Councils, and worked closely with community stakeholders, constantly, throughout the design process. I am familiar with the culture and lifestyle of rural Alaska, and I have typically been a champion for my clients goals.

Also, I have taken graduate courses in Arctic Engineering and Arctic Utility Distribution. I have amassed and read a small, personal, technical library on the subject of Arctic Utilities.....so this is a facet of Civil Engineering that I find particularly interesting. I have academic knowledge of most available water/wastewater technologies, even those that I have not personally worked with.

If you need a more formal synopsis of my skills/ experience, I could send you a resume (but I would likely need some time to custom tailor it to highlight the pertinent skills).

I am a full time resident of Fairbanks.

Also, below you mention a concept that is sometimes referred to as "appropriate technology". This concept holds a philosophy that each community is unique, and thus each community would be best served by a unique system. It is not a "one size fits all" way of solving problems. As an example, in Venetie, a recent sanitation program built numerous, old fashioned, pit latrines throughout the village. I realize that Senator Kookesh, and government policy makers in general, would probably prefer a more advanced solution to sanitation problems. However, this did provide an incremental improvement over their previous system (a honey bucket system, with no organized collection). A more desirable and long term solution in Venetie might have been a piped wastewater collection system serving a sewage lagoon. In any case, as you mention below, "simple and efficient" is always a goal.

The presence, or absence of permafrost has profound effect on the type of water or wastewater technology that is utilized. There really are a whole bunch of technological options for addressing water and wastewater needs.....so the decision making process is rather complex. And of course, there's always the element of funding....which always has impact on what systems are selected!

Anyway, thanks for getting back in touch, and please contact me again when convenient. I have an interest in being involved with this.

-Jeff

From: Dorothy Shockley [mailto:Dorothy_Shockley@legis.state.ak.us]
Sent: Thursday, December 15, 2011 2:07 PM
To: Organek, Jeff C (DOT)
Subject: RE: rural water/ sewer issues

Hi Jeff,

This is great, great news! I am proposing we have an engineer on the task force. Would you provide me with more details on where you worked and what type of systems you installed? Where do you live now? I would be very interested in talking to you. As you may or may not know there are a lot of systems out there that are way to elaborate and we need to scale back to simple efficient systems, in some cases a private well and septic system or one that could be shared by a few homes that are close in proximity.

Thank you for your interest and I look forward to talking more.

Dorothy J. Shockley
Office of Senator Albert Kookesh
1292 Sadler Way, Rm 312
Fairbanks, AK 99701
1-888-452-3471 or 907-452-3471
Fax 907-452-3401

"Take care of the old person you are going to become" Walter Soboleff, Tlinget Elder now 102 years young

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From: Organek, Jeff C (DOT) [mailto:jeff.organek@alaska.gov]
Sent: Thursday, December 15, 2011 1:30 PM
To: Dorothy Shockley
Cc: jefforganek@hotmail.com
Subject: rural water/ sewer issues

Dorothy Shockley,

Hello. I read the article "Kookesh Calls Attention to Rural Water, Sewer issues" published in today's Juneau Empire. Of particular interest to me was that the Senator is proposing to form a task force to address this need. I am interested in getting involved with the task force, either as a member, or just a person on the sidelines to lend help as needed.

To give you some background on myself, I am a Civil Engineer, from Fairbanks. By way of both formal education, and professional practice, I am well versed in rural sanitation and arctic utility distribution. I have worked on all facets of arctic utility design (planning, reconnaissance, design, construction, management). Furthermore, I have worked in numerous villages (all north of Fairbanks) on engineering projects. This has involved frequent travel to the communities, where I interacted directly with stakeholders, building trust, communicating about their infrastructure needs, and implementing engineering projects to meet their goals.

I recently finished a term as President of the Fairbanks Chapter of the American Society of Civil Engineers. Now that this is complete, I have been looking for another volunteer opportunity that would allow me to get involved with my profession and give back to the community. I feel I have skills that would benefit the Senator's efforts to bring modern sanitation to those areas of the state lacking.

If there is an opportunity for me to get involved with this task force, in either a large or small role, please do not hesitate to contact me. My contact information is below.

Sincerely,

Jeffrey C. Organek, P.E.
ADOT&PF Engineering Manager
907-450-9072

1-4-11

Senator Albert Kookesh
State Capital, Rm 7
Juneau, Alaska 99801-1182

Senator Kookesh

I am in receipt of your correspondence concerning water + sewer projects in rural Alaska and agree with you that we are being left out.

Was it governor Knowles who said that we were going to do away with the "honey bucket"?

Here we are in 2012, and I still have to sit in the outhouse at -50 and freezing or at +70 Listening to the flies buzzing.

When are we going to get a governor that will fight for us?

I support the idea of a task force to see if there is something that can be done about this situation.

Venetie has 85-90 households that do not have water and sewer. We have looked at possibilities, but cost has always been a prohibiting factor.

Sincerely
Bill Frank Jr/A
Venetie Village Council

Dorothy Shockley

From: Jennifer Jolis <jenniferjolis@msn.com>
Sent: Thursday, December 29, 2011 4:16 PM
To: governor@alaska.gov
Subject: Rural conditions

Dear Governor Parnell:

When I came to Alaska in 1966 to live in Chalkytsik and travel in and around the Interior villages, not one of those villages had running water or a safe sewage disposal system. We used honey buckets and outhouses, and we emptied our honey buckets into the slough that ran by the village. It is now 45 years later and these conditions still continue in villages all around Alaska. It is outrageous.

In 1966 we were less than 10 years old as a state. Today no such excuse can cover the fact that we are ignoring the needs of people, young and old. It is the responsibility of government to take care of those issues essential to health and well being that the individual or his or her community cannot. We are not doing that.

We have not been a poor state for all these years. And it might be important to remember that without the settlement of issues of concern to Alaska Native peoples we would not have the wealth in our coffers that we do now--money that 'rewards us' for living here but not money for people to live in safe and sanitary conditions.

I urge you to open the purse strings to rectify this.

Jennifer Jolis
3705 Quartz Road
Ester AK 99725,
907-479-5291

Jenny Bell-Jones
308 Noyes Street
Fairbanks
Alaska 99701
907 455 0222

Governor Sean Parnell
Alaska State Capitol Building
Third Floor
P.O. Box 110001
Juneau, AK 99811-0001

December 30, 2011

Dear Governor Parnell;

I am writing to express my grave concern over the failure of the State of Alaska to fully and effectively fund new water and sewer projects in all rural Alaska communities that still lack this basic service. It is unacceptable that we still have these conditions in villages over which the State exercises jurisdiction. Sovereignty comes with responsibilities and one of those is the provision of basic health and human services. 6000+ homes without basic services is something that should be an embarrassment to the entire State.

For years I have watched in horror and disbelief as the State has expended funds on fighting against the rights of its Native citizens. Case after case has been pursued in the guise of protecting state sovereignty, and public funds and resources have been expended in a manner that, at its very best, would be considered excessively wasteful and at its worst a blatant display of racism. How can the State continue to justify those kinds of expenses while at the same time crying poor every time there is a need for expenditure on infrastructure or services in rural Alaska?

When I speak with colleagues in other parts of the United States and other countries about the living conditions in many of Alaska's villages they respond with shock to hear that such a lack of basic infrastructure still exists in what most consider one of the world's most developed nations. I am embarrassed to have to tell them that third world conditions exist throughout much of the State, and that a majority of those experiencing this are Alaska Natives. Their next question is often one about the existence of reservations (some are aware that similar conditions do exist in some parts of Indian Country) to which I have to respond that the lack of infrastructure falls squarely on the shoulders of the State as we have, with the exception of Metlakatla and some Indian allotments, no Indian Country in Alaska.

Instead of spending money on expensive law suits to defend state sovereignty in questionable ways that do not further the interests of the average citizen in any way, please start exercising the sovereignty that you do possess, and make a financial commitment to rural Alaska's infrastructure. When monies come in from minerals and oil and gas development, place the provision of basic utility services in all the villages at the very top of your spending list. Benefits from the development of Alaska's resources all too often bypass the villages; the very least your administration can do is make a commitment to insuring that basic services do not follow the same path.

Sincerely:

Jenny Bell-Jones, Fairbanks

FINDINGS:

1) Clean water and sanitation facilities are among the basic requirements for public health, social well-being and economic development.
2) The Centers for Disease Control (CDC) has linked low levels of water and sewer service and higher rates of respiratory and skin infections and invasive pneumococcal disease. Infants living in homes without adequate service are up to 11 times more likely to be hospitalized for respiratory illnesses and 5 times more likely to be hospitalized for skin infections.
3) Thirty years ago, fewer than 25% of rural Alaska households had running water and flush toilets; today, following efforts by the state and federal governments to fund and develop infrastructure, approximately 75% of rural homes have indoor plumbing
4) In 2012 an estimated 6,018 households in the state do not have potable water or safe sanitation systems, putting Alaskans at risk for health issues associated with inadequate water and sanitation.
5) _____(statement about served communities on wait list?)
6) Total annual federal and state funding for rural Alaska water and sewer projects has declined by 49% over the last nine fiscal years, from a high of $127 million to $65 million in ____(FY13?)
7) Community needs are broken down into individual projects, and prioritized by a scoring system used by funding agencies, the IHS, ANTHC, VSW, USDA-RD, EPA, and Regional Tribal Health Organizations, with emphasis on health impact and the community's ability to operate and maintain the system.
8) While funding has decreased, the cost of addressing critical health related rural sanitation needs has increased by over 60% since FY 2007; the current disparity between available funding and the cost of addressing critical health needs is approximately $638 million.
9) Of the $102,000,000 earned by the state in oil revenues between 1977 and 2009, less than half of one percent was expended on rural water and sewer projects.
10) In order to protect the public health and welfare of the state's citizens and promote healthy communities, the legislature finds that it is the responsibility of the legislature to ensure that safe and sustainable water and sewer system are provided for all state residents.

ALASKA WATER AND SEWER TASK FORCE – appointed by ___ ?

2 senators

2 representatives

1 civil engineer

1 federally funded tribal health organization engaged in water and sanitation facility development

1 federal agency

1 state agency

2 public members who reside in communities off the road system

DUTIES

Submit findings and proposed legislation by December 1, 2012. . .

Report to legislature by first day of session 2013

1) Review methodology used to identify unserved homes, ways in which funding agencies coordinate, and processes in place to prioritize projects.
2) Research water and sewer systems used in other Arctic nations and innovations under way in Alaska
3) Evaluate which water and sewer system technologies are most appropriate and cost effective for use in rural communities in the state
4) Explore issues related to sustainability of existing sanitation facilities infrastructure
5) Recommend a participation level of funding by the State of Alaska
6) Hold public hearings ....

LEGISLATIVE RESEARCH SERVICES

Alaska State Legislature
Division of Legal and Research Services
State Capitol, Juneau, AK 99801

(907) 465-3991 phone
(907) 465-3908 fax
research@legis.state.ak.us

Memorandum

TO:

FROM: Susan Haymes, Legislative Analyst

DATE: September 22, 2011

RE: Water and Sanitation Systems in Rural Alaska
LRS Report 12.027

You asked about the current status of water and sanitation facilities in rural Alaska. Specifically, you wished to know which communities do not have running water and sewer, and the last ten communities to receive those services. You also asked about diseases and public health issues associated with the lack of water and sewer systems, and state policies that set a goal of providing water and sanitation facilities for all Alaskans.

Introduction

Clean water and sanitation facilities are among the basic requirements for public health, social well-being and economic development in American communities today. The connection between the absence of water and sanitation facilities and disease is well documented. Indeed, the vast majority of Americans and Alaskans have access to relatively inexpensive running water and sewer service. In rural Alaska, however, despite an investment of over $2 billion since 1960, and state and federal policies that call for running water and flush toilets in every rural household, over 4,000 homes still lack these basic services. There has been, however, substantial progress in the last 30 years. Today, 75 percent of rural households have water and sewer facilities compared to less than 25 percent in 1980.

Numerous challenges exist that make providing water and sanitation facilities to rural Alaska difficult. Constructing and operating a water and sewer system in rural Alaska is not only challenging but very costly. Most rural villages are small, isolated, and have a relatively low per capita income. Poor soil conditions, permafrost, and severe arctic weather create engineering difficulties. Higher fuel prices associated with isolated communities means that both construction and operation costs are disproportionately high for lower income populations. As a result, the construction, and operations and maintenance costs for these systems are much higher than the costs for systems in more populated areas or in warmer climates.

The state and federal government's investment in sanitation infrastructure continues to be important, however, because water and sewer service is essential to the prevention of disease. In households that do not have flush toilets, family members typically rely on a honey bucket–a 5-gallon bucket that serves as a toilet. In the process of hauling buckets of waste to disposal sites, spills often occur, which has led to the outbreak of epidemic diseases such as hepatitis A, hepatitis B, impetigo and meningitis. Moreover, the Arctic Investigation Program of the Centers for Disease Control (CDC) recently found links between low levels of water and sewer service and higher rates of respiratory and skin infections in one rural Alaska study, and higher rates of invasive pneumococcal disease (IPD) in a second study.

Current Status of Water and Sanitation Facilities in Rural Alaska

With regard to water and sanitation facilities, the Department of Environmental Conservation (DEC) defines a rural community as *served* or *unserved*. According to Bill Griffith, acting director, Division of Water, DEC, *served* means at least 55 percent of year-round occupants have running water and sewer.[1] Conversely, in an *unserved* community, fewer than 55 percent of homes have water and sewer services. Mr. Griffith notes that even in villages with water and sewer services, not all the homes have running water and flush toilets. For example, in 143 communities, 75-100 percent of households have water and sewer services, in 35 communities, 51-75 percent of households have services, and in 30 communities, 0-25 percent have services. There are a number of reasons for inconsistencies water and sewer service available in a community.

[1] Bill Griffith, acting director, Division of Water, DEC, can be reached at 907.269.7601.

The most prevalent is that water and sewer projects may take years to complete and homes receive service incrementally as the project advances. There are ongoing projects currently active in 20-30 villages. As a project advances additional homes receive services. Other projects are on hold, when a community is having difficulty in meeting certain requirements. For example, the community of Akiachak was having problems maintaining their sewer and water system with only a small number of homes with service. Rather than adding more homes to the system, and potentially amplifying the difficulties, the project was put on hold until the maintenance issues can be resolved. In other villages, extending water and sewer lines to homes that are situated away from the center of the village may be too expensive or practical. The community may not be able to afford to heat sewer and water lines that extend for a mile or two and serve only a few homes.

According to Mr. Griffith, of Alaska's 250 rural communities, the following 35 meet the definition of *unserved*:

Akiachak	Chalkytsik	Eek	Lower Kalskag	Shageluk	Teller
Alatna	Chefornak	Kipnuk	Lime Village	Shishmaref	Tuluksak
Allakaket	Circle	Kivalina	Newtok	Stebbins	Tununak
Arctic Village	Crooked Creek	Kongiganak	Oscarville	Stevens Village	Venetie
Atmautluak	Diomede	Koyukak	Platinum	Stony River	Wales
Birch Creek	Eagle Village	Kwethluk	Ruby	Takotna	

Mr. Griffith notes that this list may not include some small communities that lack either a Tribal or city governing body. Most of the unserved villages are located in the Yukon-Kuskokwim region, which also has the lowest per capita income, the most occupants per household, and the lowest proportion of villages with water sanitation facilities in Alaska. According to DEC, approximately 4,276 homes still use an outhouse or honey bucket.[2]

Recent Communities to Receive Sanitation Facilities

The following table shows the ten most recent communities to have received or that will soon receive sanitation facilities. According to Mr. Griffith all of the projects are community systems providing running water and sewer to individual homes and are piped-water and sewer, or water and sewer haul systems. In a water and sewer haul system, external holding tanks provide clean water and store wastewater for each home. Water is distributed to households by pressurized pipes, and city vehicles and equipment fill the water tanks and remove the waste from sewage tanks. Each of these projects include water source, water treatment plant, water storage tank(s), water distribution system, house plumbing, sewage collection system, and sewage treatment and disposal facilities.

The sources of funding for these projects include a combination of the following:

- Grants through the Indian Health Service (IHS) - 100% federal funding (either IHS funds or Environmental Protection Agency (EPA) Tribal funds)
- Grants through the State of Alaska – 75 percent federal/25 percent state (federal funding is from either the EPA or the U.S. Department of Agriculture (USDA)-Rural Development Program)

Mr. Griffith notes that because these projects can take up to ten years to complete, determining the exact amount that has been allocated from each source would be difficult.

[2] Bill Griffith, "Alaska Village Sanitation: Current Status and the Need for New Technology," January 2011. We include a copy of the report as Attachment A. The report can be accessed at *www.arctic.gov/.../jan.../ARC%20Workshop%20-%20Bill%20Griffith.ppt.*

Ten Most Recent Rural Communities to Receive Water and Sanitation Facilities				
Community	Project	Number of Homes	Total Costs	Completion Date
Akiak	Piped Water and Sewer	90	$18,000,000	September 2010
Chuathbaluk	Piped Water and Sewer	45	$13,000,000	October 2011
Fort Yukon	Piped Water and Sewer	246	$49,000,000	June 2012
Goodnews Bay	Piped Water and Sewer	76	$17,000,000	September 2010
Hooper Bay	Piped Water and Sewer	221	$55,000,000	October 2013
Kwigillingok	Water and Sewer Haul	87	$32,500,000	June 2012
New Kasigluk	Piped Water and Sewer	75	$29,500,000	June 2012
Nunam Iqua	Piped Water and Sewer	43	$17,000,000	September 2010
Pitkas Point	Piped Water and Sewer	31	$12,500,000	October 2011
Quinhagak	Piped Water and Sewer	165	$45,000,000	October 2013
Total		1,079	$288,500,000	

Notes: Each of these projects include water source, water treatment plant, water storage tank(s), water distribution system, house plumbing, sewage collection system, and sewage treatment and disposal facilities. The funding for all of the projects includes a combination of federal and state sources.
Sources: Bill Griffith, acting director, Division of Water, Department of Environmental Conservation, 907.269.7601.

Public Health Issues

The relationship between sanitation conditions and the impact on health have long been acknowledged. We know that safe drinking water and waste water systems are essential to the prevention of disease. According to the Village Safe Water Program, in 1994 only 37 percent of rural Alaska households had adequate sanitation facilities. Today, 75 percent of rural Alaskan homes have running water and flush toilets. While this represents substantial improvement, one family in three still does not have access to a sanitary means of sewage disposal or an adequate supply of safe water in their homes. For members of these households, plastic buckets, commonly known as honey buckets, or pit privies are the only means of human waste disposal.[3] Because waste is often spilled during transport to sewage lagoons or disposal sites, the exposure to residents, especially children, has been linked to cyclic epidemics in communities such as hepatitis A, hepatitis B, impetigo and meningitis. For example, nearly 2,000 people, mostly children, in the Yukon-Kuskowkim region were affected in a hepatitis outbreak in the mid-1980s.[4] Rural villages with honey bucket systems accounted for 72 percent (218 of 301) of the reported cases of hepatitis A in 1988. A hepatitis A outbreak in 1993 sickened more than 250 people in the Tok and Kotzebue areas. According to the state Epidemiology Section, the 1993 outbreak was consistent with previous outbreaks that have occurred in rural Alaska about every decade, in which "most transmission appears to be person-to-person by the fecal-oral route."[5]

In 1990, nearly 80 people in the Lower-Yukon River village of Kotlik contracted viral meningitis when sewage overflowed underground bunkers and oozed to the surface, and then was tracked into homes by unsuspecting children and adults. At the same time, a similar illness was reported in the nearby villages of Stebbins, Alakanuk, Emmonak, and Aniak. According to the

[3] *http://dec.alaska.gov/water/vsw/pdfs/vswbrief.pdf.*

[4] U.S. Congress, Office of Technology Assessment, *An Alaskan Challenge: Native Village Sanitation*, OTA-ENV-591, May 1994. The report can be accessed at *http://www.princeton.edu/~ota/disk1/1994/9401/9401.PDF.*

[5] State of Alaska Epidemiology Bulletin, "Hepatitis A – Continuing Rural Spread," Bulletin No. 16, May 5, 1993, *http://www.epi.alaska.gov/bulletins/docs/b1993_16.htm.*

state Epidemiology Section, the cause of the outbreak was identified as an enterovirus, which is also transmitted directly from person to person.[6]

Today, most villages have access to safe drinking water; however, in areas with no running water residents must haul water home from a community-based water source, typically in five-gallon buckets. This distribution method can make obtaining enough water for basic consumption and hygiene purposes difficult. In recent studies, higher rates of certain diseases have been linked to villages with no running water.

The Arctic Investigation Program (AIP) of the Centers for Disease Control (CDC) looked at the relationship between in-home piped water and wastewater services and hospitalization rates for respiratory tract, skin, and gastrointestinal tract infections in rural Alaska.[7] The study found that rural homes without running water experience higher rates of pneumonia and other serious lower respiratory tract infections than do homes where water is readily available. The study also found that homes where water is hauled and honey buckets are used suffer higher rates of antibiotic –resistent *staphylococcus aureus* or staph and other skin infections. The CDC team noted as "particularly disturbing" their finding that villages where running water and sewer services are present in less than ten percent of homes have experienced a respiratory infection hospitalization rate that was five-times higher than that of the general U.S. population, and a pneumonia hospitalization rate among infants that was 11 times higher. In an *Anchorage Daily News* article, the study's author, Dr. Thomas Hennessy, noted that it is "quite astounding to think that one out of three babies in such villages gets hospitalized for breathing problems."[8] The problem does not appear to be bad water, as areas where a high percentage of residents haul their own water did not show elevated rates of infectious diarrhea. Rather, it is diseases associated with poor hygiene that remain health threats for villages lacking in-home water service. The study found that, "the most likely explanation for such an effect is that the reduced availability of water decreases handwashing," which leads to increased transmission of respiratory pathogens and other infections.[9]

The second study also conducted by the CDC Arctic Investigation Program concluded that high rates of invasive pneumococcal disease (IPD) among children in Alaska are associated with lack of in-home piped water.[10] The study found that IPD rates in Yukon-Kuskokwim Alaska Native children were twice as high in villages where less than ten percent of houses had in-home piped water compared with villages where more than 80 percent of houses had in-home piped water.[11]

The Rural Alaska Sanitation Coalition (RASC), among others, emphasizes that even though construction costs are typically paid by a variety of grant sources, many rural systems, once built, are not financially sustainable due to high operating costs.[12] The RASC notes that sanitation systems are built to meet certain requirements and are then expensive to operate on a daily basis. In addition, higher energy costs translate to higher sanitation (as well as fuel and food) costs. As costs increase and residents cannot afford to pay for sanitation services, water and sewer services are turned off, returning residents to the days of honey buckets and hauling water.[13] The costs of water and sewer user fees in rural communities is typically between five and eight percent of median household income compared to fees in other parts of Alaska, which range from one to one and a half

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[6] State of Alaska Epidemiology Bulletin, "Outbreak of Viral Meningitis Strikes Alaska," Bulletin No. 14, July 25, 1990, *http://www.epi.alaska.gov/bulletins/docs/b1990_14.pdf*.

[7] Thomas W. Hennessy, MD, MPH et al., "The Relationship Between In-Home Water Service and the Risk of Respiratory Tract, Skin, and Gastrointestinal Tract Infection Among Rural Alaska Natives," *American Journal of Public Health*, Vol. 98, No. 11, November 2008. We include a copy of the article as Attachment B.

[8] George Bryson, "Respiratory Infections in Bush Raise Alarm – CDC Study: Villages that Have to Haul Water Have Higher Illness Rates," *Anchorage Daily News*, April 2, 2008.

[9] A minimum of 15 gallons of water per person per day is needed for consumption and adequate sanitation.

[10] Invasive pneumococcal disease (IPD) is an infection caused by a type of bacteria called *Streptococcus pneumonia*. Infection can result in pneumonia, bacteremia (infection of the blood), and bacterial meningitis (U.S. Department of Health and Human Services).

[11] Jay D. Wenger, MD et al., "Invasive Pneumococcal Disease in Alaskan Children," *The Pediatric Infectious Disease Journal*, Volume 29, Number 3, March 2010. We include a copy of the article as Attachment C.

[12] State and federal agencies, as well as Native organizations and communities all recognize the importance of creating sustainable water and sewer systems. Numerous experts have expressed the need for new technologies and innovation that could lead to water and sewer facilities that are easier and cheaper to maintain.

[13] Field Hearing before the Committee on Indian Affairs, United States Senate, August 28, 2008, "Rural Alaska Native Communities and Alternatives Opportunities for Alternative and Conventional Energy Development (*http://www.indian.senate.gov/public/_files/August282008.pdf*).

percent. In essence then, the communities with the lowest income per capita pay more for sanitation, heating fuel, food and other necessities.

Past Policies Supporting Adequate Water Sanitation Systems in Rural Alaska

For the last 50 years the state of Alaska and the federal government have sought to improve water sanitation systems in rural Alaska. In 1959, Congress passed the Indian Sanitation Facilities Act (P.L. 86-121), which authorized the U.S. Public Health Service to use federal funds to design and construct water, wastewater and solid waste facilities for American Indian and Alaska Native homes. As a result, the Indian Health Service began efforts to improve sanitation in Alaska villages. In 1972, the Alaska Legislature enacted the Village Safe Water Act and began contributing state resources for construction of water projects.[14] While subsequent administrations sought to improve sanitation conditions in rural Alaska, it was not until 1992, that the Hickel administration announced the state's goal of replacing honey buckets with water sanitation systems in all of Alaska's rural villages.[15] In 1992, Governor Hickel directed the Department of Environmental Conservation to assemble an Alaska Rural Sanitation Task Force to develop a program to improve rural sanitation. The stated goal of the 45 member Task Force, represented by 27 state, federal, Native and rural organizations, was

> [T]hat no Alaskan be deprived of the quality of life afforded by the provision of adequate water, sewage, and solid waste services.[16]

John Sandor, then commissioner of DEC, further stated that the administration intended "to eliminate honey buckets as an accepted way of disposing wastes in Alaska. That just shouldn't be acceptable to people."[17] In October 1992, the Task Force issued "A Commitment to Alaskans," which recommended among other things, the elimination of honey buckets in villages to be replaced with piped utilities or systems that use storage tanks and all-terrain vehicle haul systems. The Task Force further recommended the state spend $22 million a year on rural water and sanitation needs, and identified operation and maintenance of existing and planned facilities as the most vital factor in ensuring long-term success of water and sanitation facilities.[18] In 1992, 104 villages lacked sanitation services.

At the same time, the Office of Technology Assessment, at the request of Senator Ted Stevens, conducted a review of the status of the federal government's efforts to provide modern sanitation to rural Alaska.[19] Additionally, in 1993, Congress established a Federal Field Work Group (FFWG) on Alaska Rural Sanitation with the EPA as the lead federal agency to identify means to improve the coordination and delivery of water and wastewater services to rural Alaska. The main objective of the FFWG was the elimination of honey buckets and their replacement with systems that do not require individual residents to haul drinking water to their homes or "haul away their own wastes for disposal."[20]

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[14] In Alaska the legislature is charged under the constitution to "provide for the promotion and protection of public health" (Article VII, Section 4).

[15] The Indian Health Services began funding the construction of sanitation systems in the 1960s. Previous administrations supported clean water and sanitation in rural Alaska and beginning in 1972, allocated funds to build new systems. The Hickel administration was the first to declare a goal of 100 percent modern sanitation systems in rural Alaska.

[16] Alaska Rural Sanitation Task Force, *A Commitment to Alaskans*, October 1992.

[17] David Hulen, "Bad Water for Many Alaskans, No Escape from Disease One Village Says Enough is Enough, Determined Emmonak Brings Home a Piped Utility System," *Anchorage Daily News*, September 24, 1992.

[18] Between 1972 and 1994, the state contributed $300 million to sanitation projects. In 1993, federal, state, and Native leaders agreed to allocate $50 million a year to improve sewage and sanitation services in rural Alaska villages. At the time only 37 percent of rural Alaska households had adequate sanitation facilities. State officials estimated it would cost at least $1.1. billion to bring safe water and sanitation all rural residents, which they acknowledged meant the project, would take 20-25 years to complete.

[19] U.S. Congress, Office of Technology Assessment, *An Alaskan Challenge: Native Village Sanitation*, OTA-ENV-591, May 1994. The report notes that providing safe water and sanitation systems to rural Alaska has been more difficult, expensive and time-consuming than in any other region of the country, particularly because of unusual technical constraints.

[20] Environmental Protection Agency, Water Division, *Federal Field Work Group Report to Congress on Alaska Rural Sanitation*, August 1995, EPA 910/R-95-002.

The Knowles administration continued the work started by the Hickel administration. During his campaign and after his election, Governor Knowles set a goal of "putting the honey bucket in the museum by 2005." In 1995, Governor Knowles appointed 20 members to the Council on Rural Sanitation, including four state lawmakers and representatives of state, federal, tribal, and private agencies to find a way to bring running water and flush toilets to the 40 percent of rural homes lacking them. At that time, approximately 8,000 households lacked flush toilets and water faucets. The Council proposed an ambitious eight-year work plan that would cost $1.1 billion or $110 million per year to construct adequate services for an average of 1,000 homes per year. The Council recommended the State of Alaska provide a minimum of $25 million per year, with additional funds from the EPA and USDA, as well as issuing state general obligation bonds.[21] In 1996, Michele Brown, then commissioner of DEC, stated that one of her priorities was "for every rural Alaska community to get a modern water and sewer in place"[22]

During this time, the federal government increased funding for sanitation facilities in Alaska. Consequently, from 1991 to 2010, the state and federal government invested over $1.6 billion in rural Alaska sanitation services. As a result, 75 percent of rural Alaskan homes now have water and sewer facilities, a significant increase from 40 percent of such households in 1995. The DEC estimates that an additional $735 million is needed to provide first time service to households lacking water and sewer, and maintenance on existing systems.[23]

Subsequent administrations have maintained the goal of providing safe drinking water and sanitation facilities to all communities in rural Alaska. For example, one of the goals of the Alaska Health Care Strategies Planning Council created by Governor Sarah Palin in 2007 was "all Alaskan communities will have clean and safe water and wastewater systems."[24] The Alaska Health Care Commission in its 2009 report noted the importance of adequate sanitation systems in the prevention of disease and recommended the state bring sustainable and appropriate safe water and wastewater systems to every Alaska community.[25] According to the Office of Management and Budget, under state performance measures, one of DEC's performance targets is "100 percent serviceable rural Alaska homes are served by safe and sustainable sanitation facilities."[26]

We include a list of state, federal, and private entities involved in the construction and maintenance of rural sanitation facilities in Appendix A.

We hope this is helpful. If you have questions or need additional information, please let us know.

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[21] Council on Rural Sanitation, *Rural Sanitation 2005 Action Plan*, January 7, 1998.

[22] Lisa Demer, "Officials Say State Health System's Outdated," *Anchorage Daily News*, December 3, 1996.

[23] The DEC notes that funding from all sources (federal and state) for rural Alaska sanitation projects has declined by over $49 million, or 39 percent between fiscal years (FY) 2004-2011. Thus, the disparity between available funding and Alaska sanitation needs is approximately $648 million. Bill Griffith, Division of Water, DEC, "Alaska Village Sanitation: Current Status and the Need for New Technology," January 2011.

[24] Alaska Health Care Strategies Planning Council, "Final Report: Summary and Recommendations," December 23, 2007. The report can be accessed at *http://www.hss.state.ak.us/commissioner/legislature/pdf/HCSPC_report.pdf*.

[25] Alaska Health Care Commission, "Transforming Health Care in Alaska: 2009 Report/2010-2014 Strategic Plan," January 2010. The report can be accessed at *http://hss.state.ak.us/healthcommission/docs/report.pdf*.

[26] *http://omb.alaska.gov/html/performance/details.html?p=43*.

Appendix A

Entities Involved in Alaska Water and Sanitation Issues

We identified the following state, federal, and private entities involved in the construction and maintenance of rural sanitation facilities.

State Agencies

The **Rural Utility Business Advisor (RUBA) Program, Department of Commerce and Community Economic Development,** offers management assistance and financial training related to water and wastewater utilities to over 40 Alaska rural communities. The program focuses on communities currently constructing facilities and those scheduled to receive new or expanded sanitation services. Program staff assess management and financial conditions of rural utilities, develop work plans, and identify tasks for utility staff, city and village councils to address utility management issues. More information on RUBA can be accessed at *http://www.commerce.state.ak.us/dca/ruba/ruba.htm.*

Municipal Grants and Loans, Division of Water, Department of Environmental Conservation (DEC) administers the **Alaska Clean Water Fund**, which makes low interest loans available to Alaskan municipalities and other qualified entities for financing wastewater and water quality related projects. Loans can finance costs for planning, design and construction of publicly owned facilities, as well as serve as a local match for federal and state funding sources. More information can be accessed at *http://www.dec.state.ak.us/water/MuniGrantsLoans/index.htm#.*

Operations Assistance, Division of Water, Department of Environmental Conservation (DEC) administers the Operator Training and Certification Program and the Small Water/Wastewater System Operator Reimbursement Program. The Training and Certification Program develops training programs, administers examinations and certifies operators of community water and wastewater systems. The Reimbursement Program reimburses water and wastewater operators of eligible systems for costs associated with continuing education. Eligible systems include those that serve communities with less than 10,000 residents. More information on the Operations Assistance Program can be accessed at *http://dec.alaska.gov/water/OpAssist/index.htm.*

The **Village Safe Water (VSW) Program, Department of Environmental Conservation (DEC)** works with rural communities to develop sustainable sanitation facilities. Communities apply to VSW for grants which are awarded to the highest ranking applicants. Successful applicants must have the financial, managerial and technical capacity to properly operate a facility once it is built. Funding for the program comes from federal and state sources. The VSW staff provide technical and financial support to rural communities to design and construct water and wastewater systems. For some projects, funding is awarded by VSW through the Alaska Native Tribal Health Consortium, who then assist communities in the design and construct of sanitation projects. More information on the VSW Program can be accessed at *http://dec.alaska.gov/water/vsw/index.htm.*

Alaska Department of Transportation and Public Facilities (DOTPF) provides funds for roads, trails, and boardwalks that are necessary for water and sewer haul systems. The Statewide Transportation Improvement Program (STIP) can be accessed at *http://www.dot.state.ak.us/stwdplng/cip/stip/.*

Federal Agencies

The **Rural Development Water and Environmental Program, United States Department of Agriculture (USDA)** provide loans, grants, and loan guarantees for drinking water, sanitary sewer, solid waste and storm drainage in rural Alaska. The program also makes grants to nonprofit organizations to provide technical assistance and training to assist rural communities with their water, wastewater, and solid waste problems. Information on the USDA Alaska Rural Development Program can be accessed at *http://www.rurdev.usda.gov/ak/Director.htm*

The **Denali Commission**, established by Congress in 1998, is an independent federal agency designed to provide critical utilities, infrastructure, and economic support throughout Alaska. The Commission also coordinates government efforts and collaborates with many federal and state programs in Alaska. For example the Commission provides funds to DEC, the ANTHC, and rural communities for the design, construction and renovation of washeterias. At the direction of the Alaska Congressional Delegation, a new work group was formed in 2010, the Sustainable Rural Communities to develop a federal agency assessment and to evaluate and identify barriers to sustainable rural development in Alaska. The Denali Commission can be accessed at http://www.denali.gov/.

The **Alaska Native Village and Rural Communities Grant Program, Environmental Protection Agency (EPA)** created in 1995, provides funding to Alaska Native villages and rural communities for construction of new or improved drinking water and wastewater systems, as well as training and technical assistance in the operations and maintenance of these systems. The Alaska DEC administers the funds through the Village Safe Water Program. The program has allocated the DEC over $450 million in funds from 1995 through 2010. More information on the program can be accessed at http://water.epa.gov/type/watersheds/wastewater/Alaska-Native-Village-and-Rural-Communities-Grant-Program.cfm.

Office of Native American Programs (ONAP), Department of Housing and Urban Development (HUD) awards grants to tribes and other tribal entities to provide affordable housing and community grants to provide for suitable living environments and economic opportunities. At the request of Congress, ONAP is currently conducting a Housing Needs Study of Native Americans. The ONAP recently conducted seven regional sessions, including a two day meeting in Anchorage Alaska in March 2011, which was attended by some 141 government, tribal, community and private representatives. Attendees identified water, sewer, and sanitation issues as necessary to build sustainable communities and infrastructure. More information on ONAP and the Needs Study can be accessed at http://portal.hud.gov/hudportal/HUD?src=/program_offices/public_indian_housing/ih/codetalk/onap.

The **Division of Sanitation Facilities Construction, Indian Health Services (IHS)** administers a nationwide Sanitation Facilities Construction (SFC) Program provides technical and financial assistance to American Indians and Alaska Natives for essential water supply, sewage disposal, and solid waste disposal facilities. The SFC Program was created in 1959 (Public Law 86-121) to protect the health of and prevent disease among American Indian and Native Alaska populations, primary IHS objectives. In Alaska, the ANTHC manages the SFC Program. In addition, the State of Alaska through its Village Safe water program participates in many jointly funded IHS construction projects. More information on the SFC Program can be accessed at http://www.ihs.gov/dsfc/. The Alaska Area Office of IHS can be accessed at http://www.ihs.gov/facilitiesServices/areaoffices/alaska/.

Private Organizations

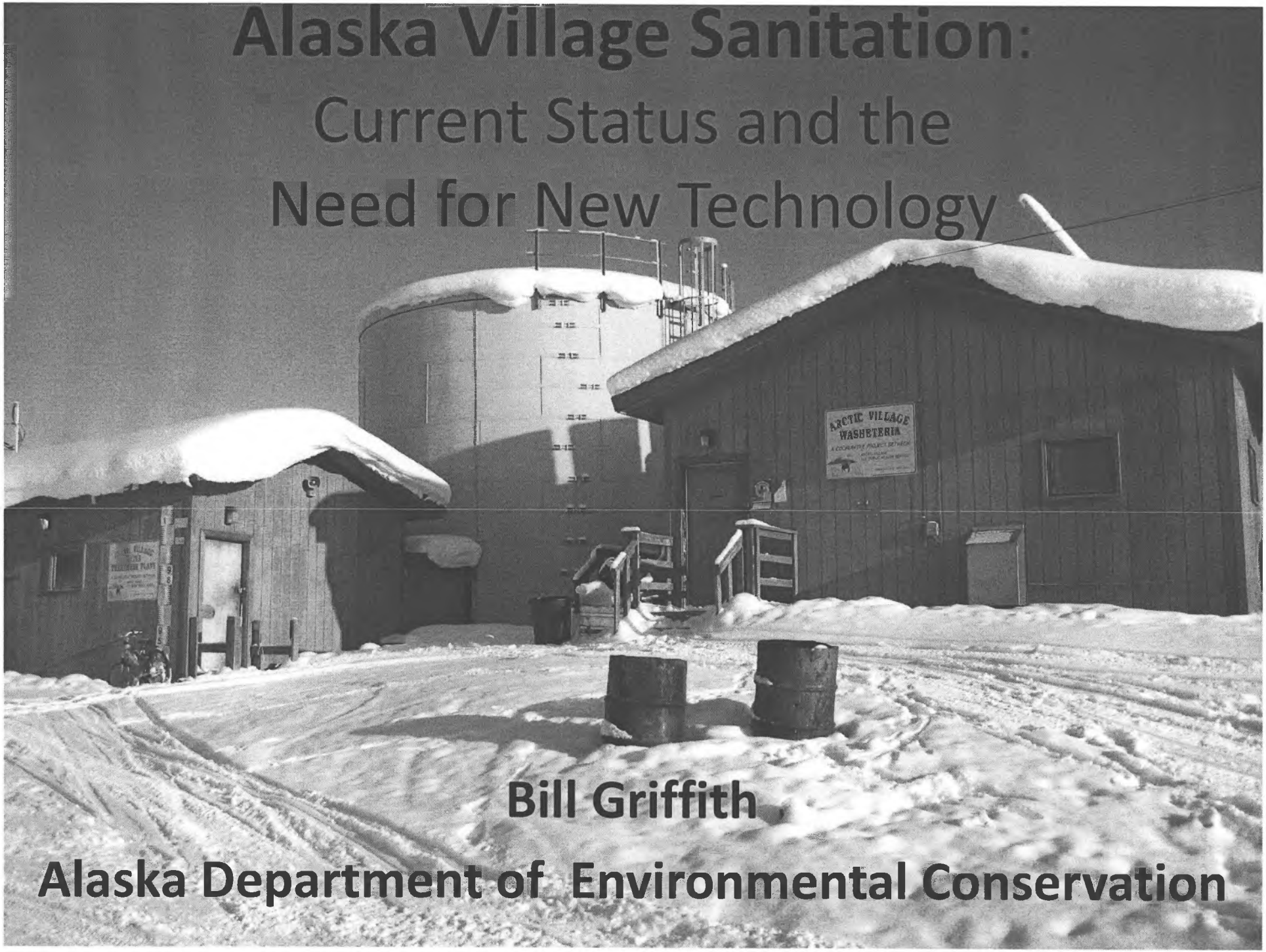
The **Alaska Native Health Board (ANHB)**, established in 1968, is a Tribal health advocacy organization, representing 25 Alaska Tribal health entities. The ANHB serves as Advisor to the Director of the Alaska Area Native Health Services, the U.S. Committee on Indian Affairs, and the House Interior and Insular Affairs Committee on federal legislation and appropriations. The ANHB manages the Rural Alaska Sanitation Coalition. More information on ANHB can be accessed at http://www.anhb.org/.

Division of Environmental Health & Engineering, Alaska Native Tribal Health Consortium (ANTHC), provides planning, design, construction, and operations support for water and sanitation projects throughout Alaska. The ANTHC and DEC's Village Safe Water coordinate the construction of most rural sanitation projects. The ANTHC recently completed construction of a water and sewer system in Goodnews Bay, bringing running water to 68 homes. More information on ANTHC can be accessed at *http://www.anthctoday.org/dehe/*.

The **Rural Alaska Sanitation Coalition (RASC)** serves as an advocate for underserved rural Alaskan communities regarding sanitation and health issues. The RASC is funded by the Alaska Housing Finance Corporation (AHFC) and program operations are managed by the Alaska Native Health Board. RASC is composed of representatives from each of the 25 regional tribal health organizations. The RASC's current focus is the need for operation and maintenance funding for

water and wastewater systems ant to ensure sustainability of systems once they are built. More information on RASC can be accessed at *http://ruralrasc.org/.*

The **Alaska Rural Water Association (ARWA)** provides on-site technical assistance and training for water and wastewater systems in rural Alaska. The ARWA offers a drinking water circuit rider program and a wastewater technical assistance and training program, funded by the United States Department of Agriculture, which provides on-site and regional training and technical assistance. More information on ARWA can be accessed at *http://www.arwa.org/1/.*



Alaska Village Sanitation:
Current Status and the Need for New Technology

Bill Griffith

Alaska Department of Environmental Conservation

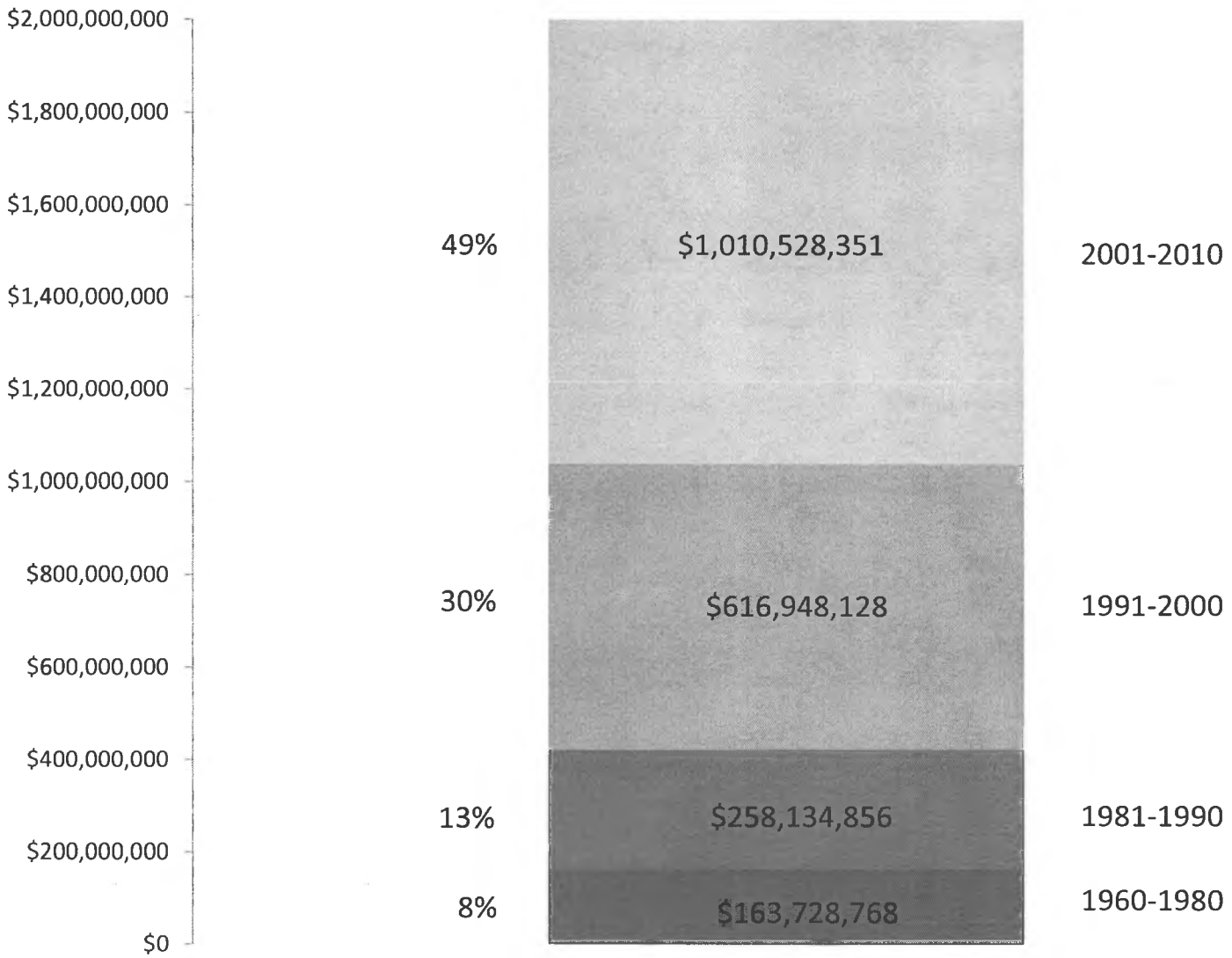
Progress in Alaska Village Sanitation

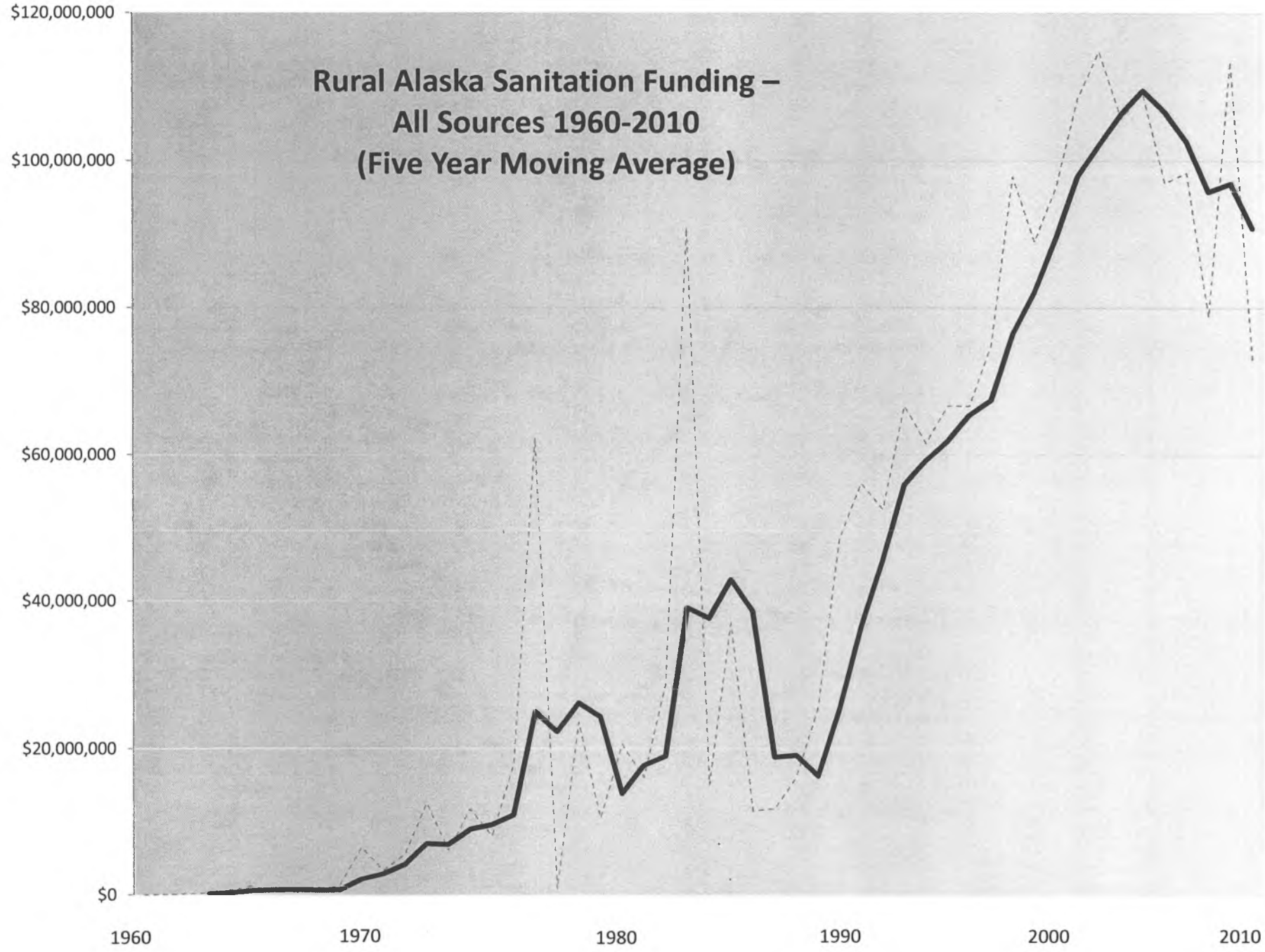
- For half a century, we've focused on "putting the honey bucket in the museum"
- Much progress has been made:
  - 30 years ago, fewer than 25% of rural Alaska households had running water and flush toilets.
  - In 1996, 55% of rural homes had piped or covered haul service.
  - Today, approximately 75% of rural homes have indoor plumbing

Boilerplate Approach Since 1970:

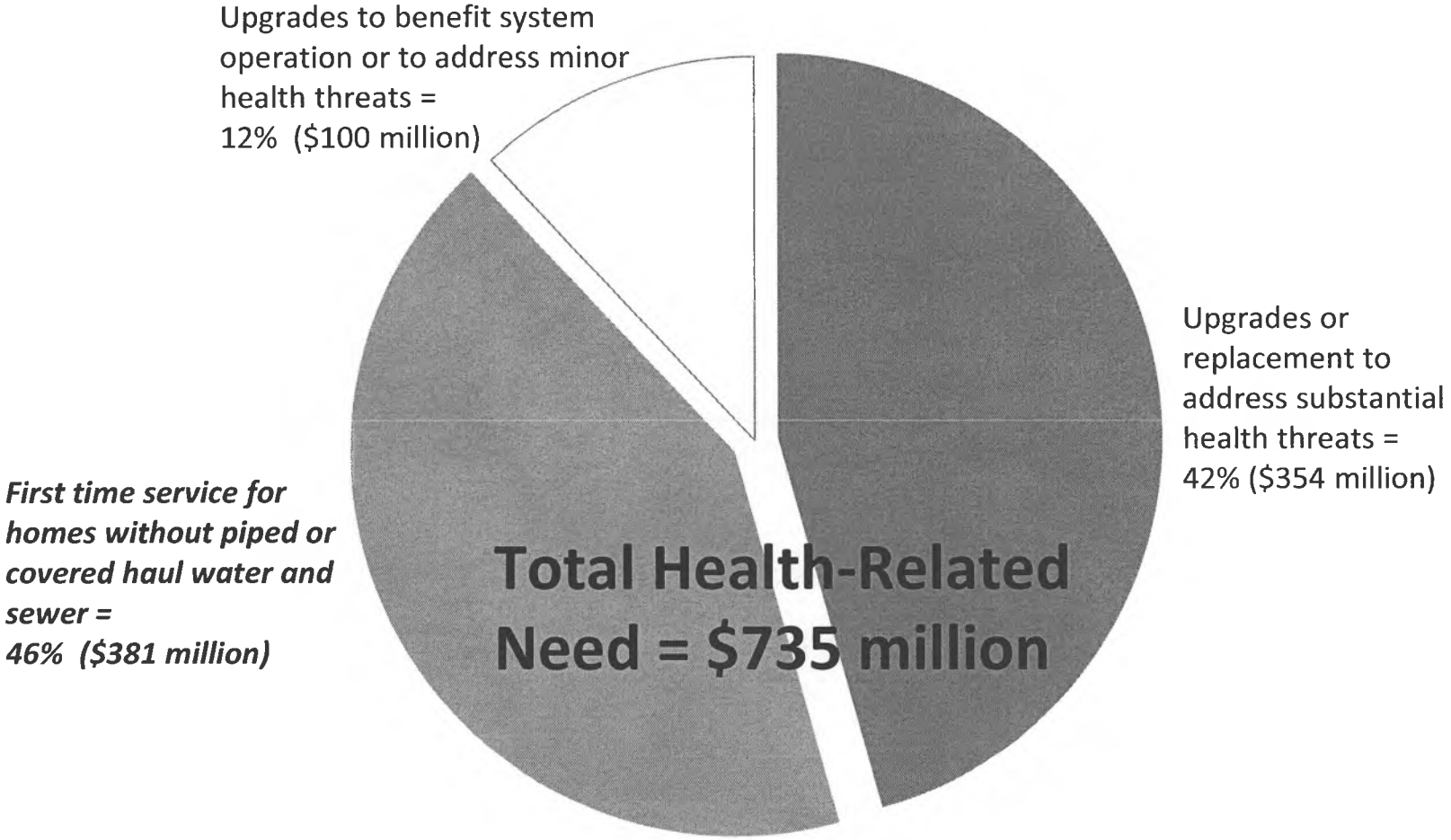
- 100% water treatment to full regulatory compliance (regardless of ultimate use)
- Storage of large quantities of water, usually requiring heat addition
- Distribution of treated water to individual homes via pipes or haul vehicle, usually requiring heat addition
- Collection of all household sewage for lagoon disposal, usually requiring heat addition

Historical Pace of Rural Alaska Sanitation Funding 1960 - 2010




Rural Alaska Sanitation Funding –
All Sources 1960-2010
(Five Year Moving Average)
$120,000,000
$100,000,000
$80,000,000
$60,000,000
$40,000,000
$20,000,000
$0
1960
1970
1980
1990
2000
2010

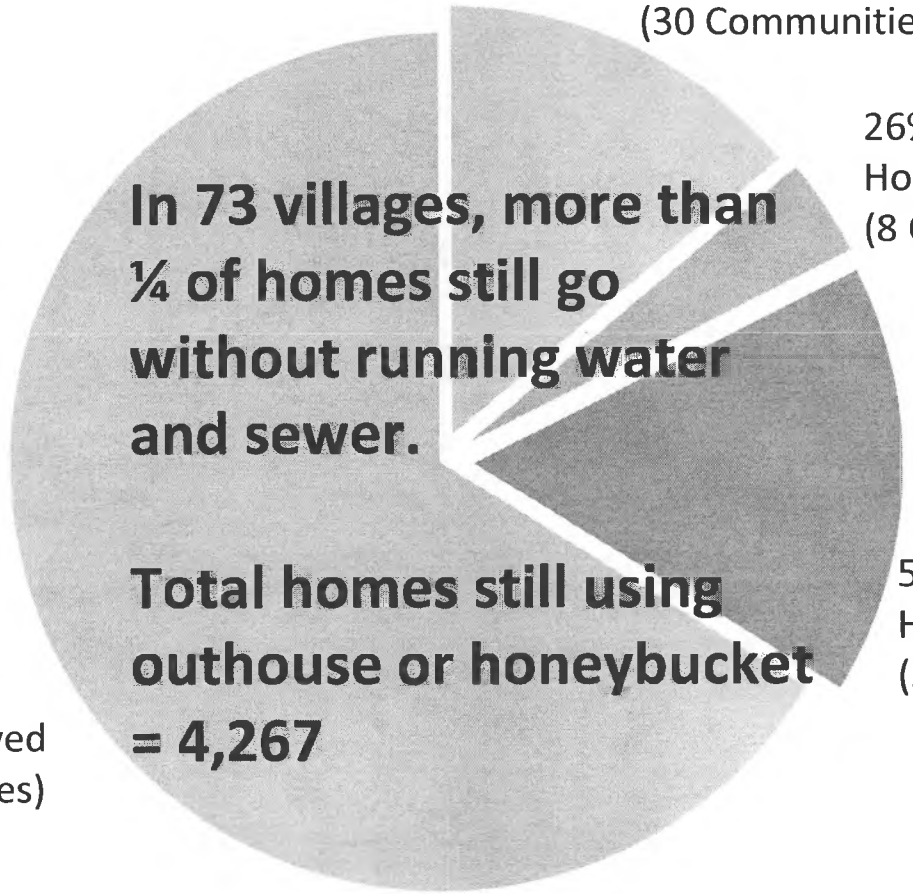
Rural Alaska Water and Sewer Needs: Much Work Remains



Note: The first time service category and the upgrades to address substantial health risks category are often conbined and referred to as "critical health related needs".

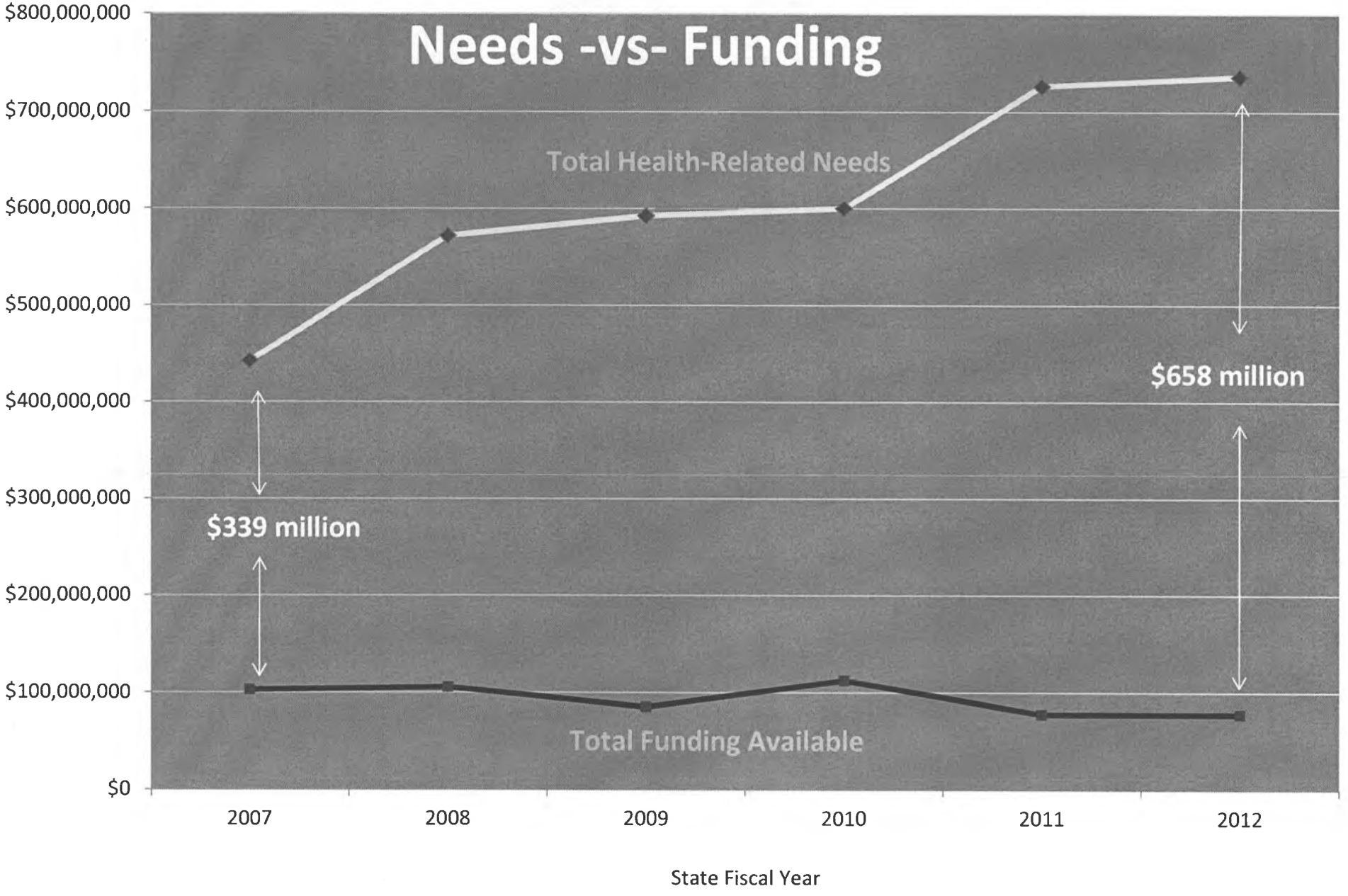
Source: Indian Health Service Sanitation Deficiency System.

Breakdown by Community:
Percent of homes served by pipes or covered haul



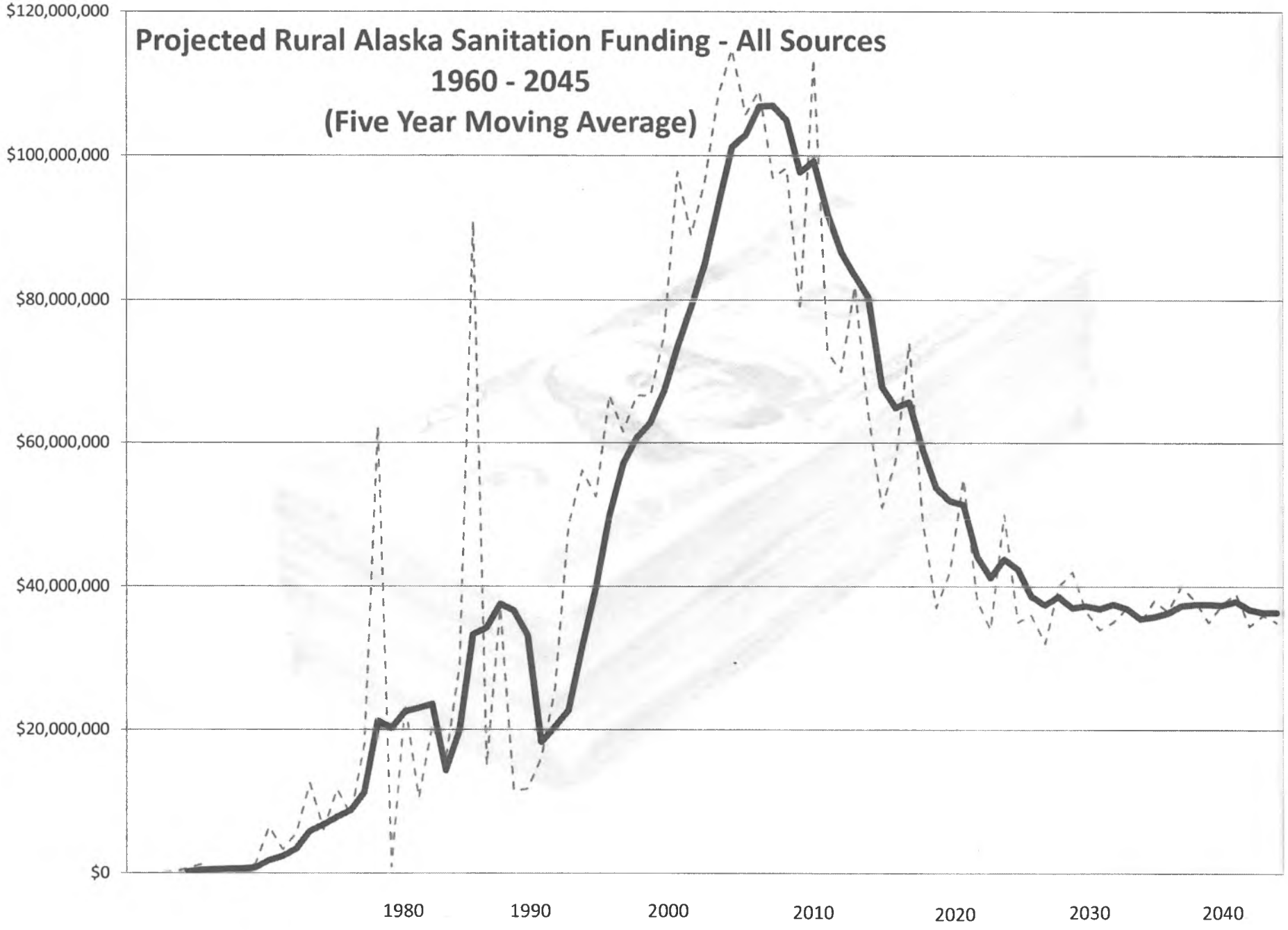
January 2011

Rural Alaska Sanitation

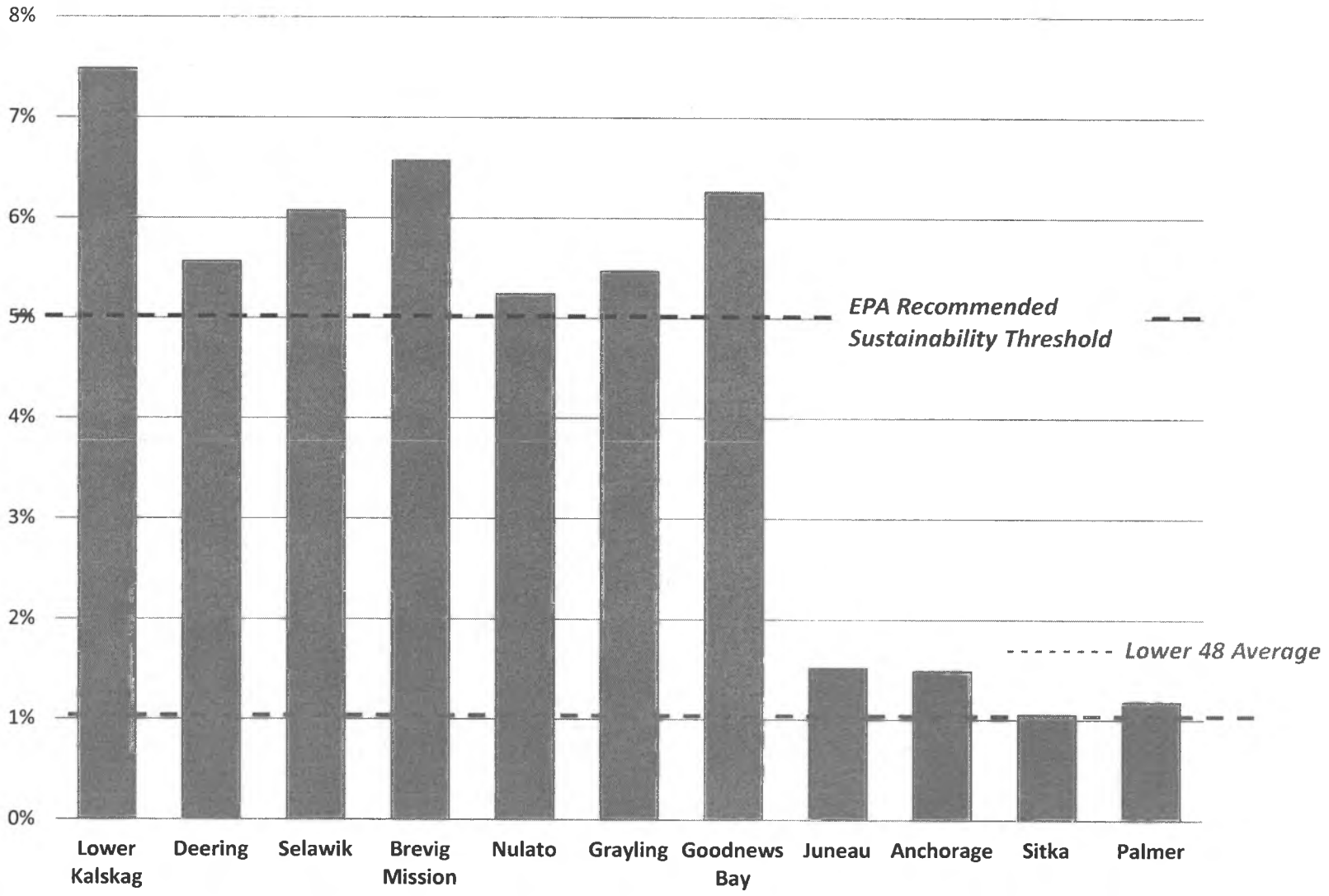


Cost to Complete New, Ongoing Piped Water & Sewer Systems

- There are 11 ongoing construction projects in Alaska villages to provide first-time piped water and sewer services.
- Most of these projects have been ongoing for several years, some for more than a decade.
- Estimated cost to complete these projects is $150 million.
- Once these projects are done, there will still be 35 villages with no water and sewer services to individual homes.


Projected Rural Alaska Sanitation Funding - All Sources
1960 - 2045
(Five Year Moving Average)
$120,000,000
$100,000,000
$80,000,000
$60,000,000
$40,000,000
$20,000,000
$0
1980
1990
2000
2010
2020
2030
2040

Water and Sewer User Fees as a Percentage of Median Houshold Income



Bottom Line:

- Boilerplate system used for the past 50 years is increasingly unaffordable to build and maintain.
- Available funding will not be adequate to serve remaining homes and make needed improvements.
- New technologies are needed now in order to address health problems associated with water and sewer system deficiencies.

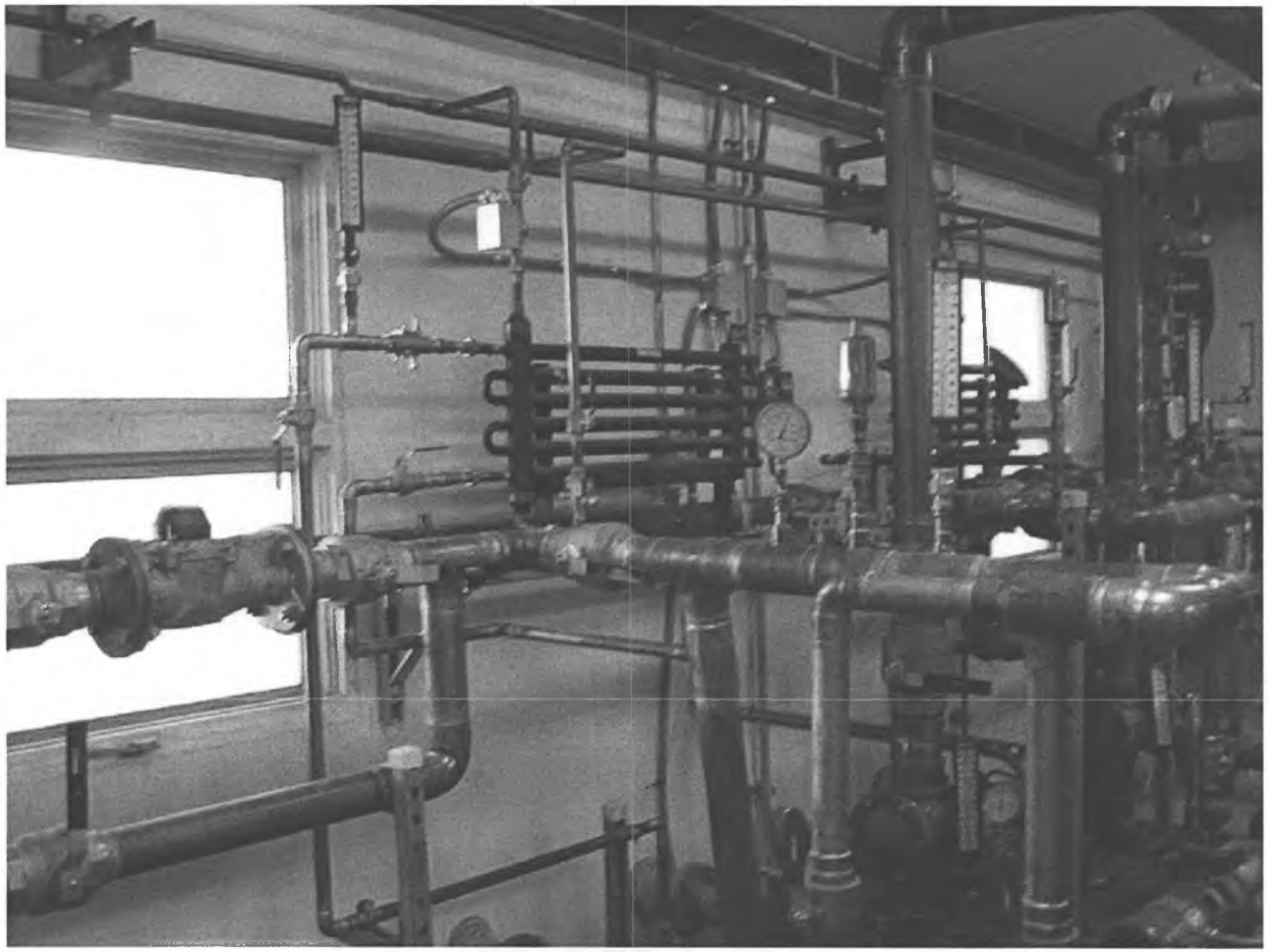
The need for technological improvements exists at every service level:

Thousands of people will continue to handle honey buckets for years to come

Water and sewer haul systems will continue to rely on transportation infrastructure

Washeterias will remain the most sustainable level of service for many villages

Many existing piped systems are at the end of their useful life or require major upgrades



Upgrades to water plants and other buildings will improve energy efficiency and monitoring capability

"Our way of life has been influenced by the way technology has developed. In the future, it seems to me, we ought to try to reverse this and so develop our technology that it meets the needs of the sort of life we wish to lead."

HRH the Duke of Edinburgh, *Men, Machines and Sacred Cows*, 1984

The Relationship Between In-Home Water Service and the Risk of Respiratory Tract, Skin, and Gastrointestinal Tract Infections Among Rural Alaska Natives

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Objectives. We investigated the relationship between the presence of in-home piped water and wastewater services and hospitalization rates for respiratory tract, skin, and gastrointestinal tract infections in rural Alaska.

Methods. We determined in-home water service and hospitalizations for selected infectious diseases among Alaska Natives by region during 2000 to 2004. Within 1 region, infant respiratory hospitalizations and skin infections for all ages were compared by village-level water services.

Results. Regions with a lower proportion of home water service had significantly higher hospitalization rates for pneumonia and influenza (rate ratio [RR]=2.5), skin or soft tissue infection (RR=1.9), and respiratory syncytial virus (RR=3.4 among those younger than 5 years) than did higher-service regions. Within 1 region, infants from villages with less than 10% of homes served had higher hospitalization rates for pneumonia (RR=1.3) and respiratory syncytial virus (RR=1.2) than did infants from villages with more than 80% served. Outpatient *Staphylococcus aureus* infections (RR=5.1, all ages) and skin infection hospitalizations (RR=2.7, all ages) were higher in low-service than in high-service villages.

Conclusions. Higher respiratory and skin infection rates were associated with a lack of in-home water service. This disparity should be addressed through sanitation infrastructure improvements. (*Am J Public Health.* 2008;98:2072–2078. doi:10.2105/AJPH.2007.115618)

Modern sanitation services (potable drinking water and safe wastewater disposal) are a cornerstone of public health progress and have contributed to decreased infectious disease morbidity and mortality. In 1950, 64.5% of US homes had complete sanitation services (a flush toilet, shower or bath, and kitchen sink).[1] This increased to 93.1% by 1970 and to 99.4% by 2000.[2,3]

In 2000, 93.7% of Alaskan homes had complete sanitation, which ranked Alaska last among US states.[3] In rural Alaska, where the vast majority of people are Alaska Natives, a much higher proportion lack basic sanitation facilities. Providing in-home sanitation services is difficult in remote villages where small, isolated populations live in a harsh, cold climate. Although many rural village homes lack in-home water service, nearly all villages have access to safe drinking water.[4] Significant gains in health status indicators have occurred among rural Alaska Natives; however, the ongoing disparity in sanitation services remains unsolved in most of rural Alaska. Furthermore, there is a disparity in infectious disease hospitalizations among Alaska Natives compared with the general US population.[5] To our knowledge, there are no evaluations of the health effects of a lack of modern sanitation services for rural Alaskans.

Alaska village residents who live without pressurized in-home water service typically obtain water from a community-based water point and bring it home in 5-gallon (19-L) plastic containers. As of 2000, one third of rural Alaska residents obtained water this way.[4] Although water is available in centralized locations, some families must travel long distances or cross rivers to obtain safe water. This distribution method makes it difficult to obtain adequate amounts of water needed for basic consumption and hygiene practices.[6] Alaska homes lacking pressurized in-home water service also lack flush toilets. Residents use outhouses or in-home waste containers commonly known as "honeybuckets" that require manual removal to a centralized waste disposal site or lagoon. Sanitation infrastructure is provided to rural Alaskans by state- and federally funded programs that have provided service first where the greatest number of homes could be served at the lowest cost.

Although it has long been recognized that access to modern sanitation services can reduce morbidity and mortality from gastrointestinal illnesses, recent data have established the important role of adequate water supplies for preventing respiratory diseases.[7–9] The value of adequate supplies of safe water has been attributed to the prevention of both waterborne diseases, in which the pathogen can be ingested from contaminated water, and water-washed disease, in which hygienic practices such as handwashing and bathing play a role.[10] We sought to describe the relationship between in-home water and wastewater service and the risks of waterborne and water-washed infectious diseases in rural Alaska. We used existing sanitation service data for rural Alaska along with hospital discharge records, a respiratory disease surveillance system, and a skin infection outbreak investigation to explore whether improved sanitation service was associated with improved health status among rural Alaska Native people.

METHODS

Population

The approximately 120 000 Alaska Natives are descendants of the indigenous population and represent 19% of Alaskans. Approximately 60% of Alaska Natives live in rural or remote villages. Of the approximately 170 rural villages, most have fewer than 300 residents, and the vast majority are Alaska Natives. Most villages are not accessible by road; travel between villages is mainly by airplane, snowmobile, or boat. Health care

services are administered by regional Alaska Native–managed tribal health organizations, with some statewide facilities and services shared and coadministered, such as the referral medical center in Anchorage.

Sanitation Services

The Rural Alaska Housing Sanitation Inventory documented water and wastewater service in rural villages from July 2001 through April 2004. Each home was evaluated, and a statewide database was created. We defined "served" homes as having pressurized, in-home water service including piped water service from a municipal system or on-site well and septic tank or drain field systems, or "closed haul" systems in which water is delivered to storage tanks and distributed throughout the home via internally pressurized plumbing. For the latter, wastewater from flush toilets is held in a storage tank and periodically evacuated by a pump truck. We used data from 6 predominantly rural regions that were defined according to the boundaries of the tribal health care organizations. We defined "high-service" regions as those in which 80% or more of homes had service and "low-service" as those in which less than 80% were served.

Water service data for 1 region (region A) were used in a village-level analysis. Because water improvements are ongoing, we excluded from analysis villages in which more than 50% of homes had new water service from 1999 through 2004 (5 villages with 2740 persons, or 11.6% of the region's population). We categorized the remaining 47 villages into tertiles according to the proportion of homes served. We analyzed region A's largest town separately because it has near-complete water service and a population approximately 5 times larger than that of the next-largest village. Household size and income data were obtained from the 2000 US Census.[11]

Regional Disease Rates

Hospital discharge data for the fiscal years 2000 to 2004 for Alaska Natives in Alaska were obtained from the Indian Health Service's (IHS's) Direct and Contract Health Service inpatient data set.[12] These data include patient discharge records from IHS-operated, tribally operated, and community hospitals that were contracted with IHS or with tribes to provide health care services to eligible persons.[13] We selected hospitalizations for the 6 predominantly rural regions and urban Anchorage. Three regions were excluded because of small hospital discharge numbers.

Hospital discharges were selected for infectious gastroenteritis, pneumonia or influenza, skin or soft tissue infection, and methicillin-resistant *Staphylococcus aureus* (MRSA) infections for all ages, and respiratory syncytial virus (RSV) for children younger than 5 years. A record was selected if 1 of these diseases was listed among the first 6 discharge diagnoses according to the *International Classification of Diseases, 9th Revision, Clinical Modification* (*ICD-9-CM*).[14]

The definitions of infectious gastroenteritis included diarrhea of determined etiology (bacterial: 001–005, 008.0–008.5, excluding 003.2; parasitic: 006–007, excluding 006.3–006.6; and viral: 008.6–008.8) and diarrhea of undetermined etiology (presumed infectious: 009.0–009.3). Pneumonia and influenza were identified with codes 480 to 487. Skin and soft tissue infections were identified with codes 680 to 682, 684, 686.8, and 686.9. Hospitalizations for MRSA were selected by code V09.0 (infection with microorganisms resistant to penicillins) among codes 038.11 (*S aureus* septicemia), 482.41 (other bacterial pneumonia caused by *S aureus*), and 041.11 (*S aureus* bacterial infection in conditions classified elsewhere and of unspecified site). Infection with RSV was defined as codes 480.1, 079.6, and 466.11. Because patient identifiers were not available, repeated hospitalizations could not be excluded.

Hospitalization rates were calculated per 10 000 persons per year for region of residence. The IHS fiscal year 2002 user population estimates (released March 2002) were used as the denominator. The user population included all Alaska Natives who had received IHS-funded health care at least once over the previous 3 years.[12] We calculated age group–specific rates, categorizing age as younger than 1 year, 1 to 4 years, 5 to 19 years, 20 to 44 years, 45 to 64 years, and 65 years or older. Rate ratios with 95% confidence intervals (CIs) were calculated with Poisson regression analysis.[15] Age adjustment with the direct method for the user population of Alaska did not substantially change the rates and is not reported.

Disease Rates Within Region A

We conducted ongoing surveillance of hospitalizations for acute lower respiratory tract infections (LRTIs) among children for region A and selected 1999 to 2004 to examine rates by village.[16,17] We abstracted clinical and laboratory information from the computerized medical records for children younger than 1 year hospitalized at the regional hospital, or in Anchorage or who received contracted medical care at a nontribal hospital. We obtained for each hospitalization the birth dates, admission and discharge rates, *ICD-9-CM* diagnosis codes and narrative, and RSV test result. We merged duplicate hospitalization data on patients transferred to another hospital. A child was classified as having pneumonia if the discharge diagnoses included 1 of *ICD-9-CM* codes 480.1, 485, 486, or 507. Infection with RSV was defined as a hospitalized child younger than 1 year with acute LRTI and a nasopharyngeal aspirate positive for RSV by culture or a rapid identification method (enzyme immunoassay or direct fluorescent antibody). The majority of RSV testing was performed with Directogen (Bectin Dickenson, Cockeysville, MD). Comparable data for all Alaska Natives and for the US general population were obtained from published sources.[17,18]

Skin infection hospitalization data were obtained from an outbreak investigation in region A.[19] We included hospitalizations for skin infections from July 1, 1999, through June 30, 2000, and used *ICD-9-CM* codes (680.0–682.9) to include carbuncle, furuncle, and cellulitis. The regional hospital laboratory was used to identify all confirmed *S aureus* cultures from skin infections for the same period. The MRSA infections were defined by a minimum inhibitory concentration of oxacillin at 2 μg/mL or greater. Clinical samples obtained at village-based clinics must be transported to the regional hospital for culture and confirmation, introducing a potential diagnostic access bias. To avoid overestimating infection rates in the 10 villages closest to the regional hospital, whose residents might seek care directly at the hospital-based clinics and hence be diagnosed more often, we excluded

TABLE 1—In-Home Water and Wastewater Service to Homes, by Region: Alaska, 2000

Region	American Indian/Alaska Native Population,[a] No.	Communities Surveyed, No.	Homes Surveyed, No.	Homes With Water Service, No. (%)	Homes With Wastewater Service, No. (%)
High service					
F	5409	25	1555	1387 (89)	1349 (87)
E	12370	26	2834	2499 (88)	2403 (85)
D	4518	4	368	368 (100)	368 (100)
Low service					
C	6867	10	834	626 (75)	627 (75)
B	7274	14	1376	782 (57)	751 (55)
A	20714	49	5513	3360 (61)	3328 (60)
Total	57152	128	12480	9022 (73)	8826 (71)

[a]Data from the 2000 US Census.[11]

from analysis persons from these villages. Population denominators were obtained from the 2000 Census.[11]

The χ^2 test for trend was used to compare hospitalization rates for villages with differing levels of water service. We adjusted for a potential confounder (number of persons per household) with the Cochran–Mantel Haenszel test comparing high-service to low-service villages.

RESULTS

Rural In-Home Water Service

We obtained water service data from 128 villages and a total of 12 480 homes in the 6 regions. Overall, 73% of homes had in-home water service (range by region: 57% to 100%). Wastewater service was present in 71% of homes; the percentages by region were similar to the proportion of homes with water service by region (Table 1). The high-service regions had 91% of homes with in-home water service compared with 61% of homes in the low-service regions.

Regional Hospitalization Rates and Water Service

Hospitalization rates by region for the 5 infectious disease categories varied by water service level (Table 2). The RSV hospitalization rate for children younger than 5 years was higher in the low-service regions than in the high-service regions (rate ratio [RR]=3.4; 95% CI=3.0, 3.8). For all ages, rates for pneumonia and influenza (RR=2.5; 95% CI=2.4, 2.7), skin or soft tissue infection (RR=1.9; 95% CI=1.8, 2.1), and MRSA infection (RR=4.5; 95% CI=3.6, 5.7) hospitalizations were also higher for low-service regions.

Hospitalization rates for infectious diarrhea did not differ between high- and low-service regions (RR=0.94; 95% CI=0.78, 1.2). Diarrhea of undetermined etiology as the only diarrhea-coded diagnosis was reported for only 4.2% of the diarrhea hospitalizations, and the removal of this diagnosis did not affect the overall rate comparison.

Higher pneumonia and influenza hospitalization rates seen among the low-service regions were seen in each age group; however, the overall excess rate was greatest among the very young and the elderly (Table 3). The hospitalization rate among children younger than 1 year was 5 times higher in low-service regions than in the high-service regions. For children aged 1 to 4 years and persons 65 years or older, the rates were at least 2 times higher in the low-service regions than in the high-service regions.

Water Service in Region A

In region A, 61% of homes had water service, but service was not uniformly distributed throughout the region (Table 4). Water service was available in less than 10% of homes for 20 villages (30% of population), in 10% to 79% for 13 villages (20% of population), and in 80% or more for 14 villages (27% of population). The largest town, with 23% of the region's population, had 99.5% of homes with water service. With the exclusion of the largest town, the other groups of villages were similar in persons per household and mean household income. Villages with less than 10% of homes served had a slightly lower median population than those with a greater proportion of homes served. The population ranges overlapped for all 3 groups, and the largest difference in median village population between groups was 181 persons.

Hospitalization Rates and Water Service in Region A

Among the regions, the highest hospitalization rates for each of the diagnoses were among persons in region A (Table 2). In particular, pneumonia and influenza hospitalization rates among the region's infants (2550 per 10 000) were more than 2 times higher than the rates for any other region (Table 3). On average, more than 25% of the birth cohort was hospitalized with this diagnosis yearly.

Hospitalization rates for infants with LRTI, pneumonia, and RSV were highest among infants in villages with the lowest level of in-home water service compared with those in other villages (Table 4). Also, we noted a trend of lower hospitalization rates for infants from villages with increasing proportions of homes served by in-home water service (Figure 1). This trend was highly significant for hospitalizations because of LRTI (P=.002) and LRTI with pneumonia (P=.007) and was present, but not statistically significant, for RSV infections and RSV pneumonia.

Relative hospitalization rates of infants from the lowest-service compared with those from the highest-service villages were as follows: LRTI (RR=1.2; 95% CI=1.1, 1.4), pneumonia (RR=1.3; 95% CI=1.1, 1.5), and RSV (RR=1.2; 95% CI=1.0, 1.6). These rate ratios were similar after adjustment for the number of household members. Compared with the overall US infant population, infants in the lowest-service villages had a 5-times-higher rate of both LRTI and RSV hospitalizations and an 11-times-higher hospitalization rate for pneumonia.

Region A had the highest rate of hospitalization for skin and soft tissue infections and for MRSA infections (Table 2). Within this region, we observed a significant trend of

TABLE 2—Hospitalization Rates per 100 000 for Specific Infections and the Proportion With In-Home Water Service, by Region: Alaska, 2000–2004

Region	Water-Served Homes, %	Infectious Diarrhea, Hospitalization Rate (No.)	RSV,[a] Hospitalization Rate (No.)	Pneumonia or Influenz,[a,b] Hospitalization Rate (No.)	Skin or Soft Tissue Infection,[b] Hospitalization Rate (No.)	MRSA Infection, Hospitalization Rate (No.)
Urban Anchorage	100	7.14 (106)	78.5 (130)	63.24 (939)	50.71 (753)	5.25 (78)
High-service region						
F	89	5.80 (16)	148.29 (39)	85.93 (237)	47.86 (132)	2.90 (8)
E	88	9.73 (70)	29.76 (15)	42.12 (303)	26.0 (187)	1.25 (9)
D	100	6.43 (14)	214.69 (57)	98.26 (214)	41.32 (90)	1.38 (3)
Total high-service regions	91	7.64 (206)	90.1 (241)	62.8 (1693)	43.07 (1162)	3.63 (98)
Low-service region						
C	75	5.78 (20)	136.42 (59)	100.87 (349)	34.10 (118)	0.58 (2)
B	57	4.06 (16)	129.48 (56)	90.82 (358)	39.07 (154)	1.27 (5)
A	61	8.72 (96)	314.48 (481)	199.82 (2200)	113.62 (1251)	26.70 (294)
Total low-service regions	61	7.17 (132)	248.90 (596)	157.89 (2907)	82.72 (1523)	16.34 (301)
Rate ratio[c] (95% CI)		0.94 (0.78, 1.17)	2.81 (2.42, 3.26)	2.54 (2.39, 2.70)	1.93 (1.79, 2.08)	4.51 (3.59, 5.66)

Note. RSV = respiratory syncytial virus; MRSA = methicillin-resistant *Staphylococcus aureus;* CI = confidence interval. Number is the total number of hospitalizations for that disease.
[a]Respiratory syncytial virus, for hospitalizations among children younger than 5 years.
[b]Three pneumonia- or influenza-associated hospitalizations and 8 skin- or soft tissue-infection hospitalizations did not have community of residence available.
[c]High- vs low-service regions.

TABLE 3—Age-Specific Hospitalization Rates for Pneumonia and Influenza and Proportion With In-Home Water Service, by Region and In-Home Water Service Level: Alaska, 2000–2004

Service Unit	Age <1 Year, Hospitalization Rate (No.)	Age 1–4 Years, Hospitalization Rate (No.)	Age 5–19 Years, Hospitalization Rate (No.)	Age 20–44 Years, Hospitalization Rate (No.)	Age 45–64 Years, Hospitalization Rate (No.)	Age ≥65 Years, Hospitalization Rate (No.)
Urban Anchorage	246.69 (81)	76.11 (100)	13.57 (60)	31.8 (179)	112.4 (286)	384.11 (233)
High-service region						
F	989.47 (47)	143.85 (31)	15.22 (14)	19.16 (17)	97.21 (47)	397.06 (81)
E	333.33 (20)	51.80 (23)	8.03 (18)	15.46 (40)	64.02 (83)	211.37 (119)
D	750.00 (42)	190.93 (40)	9.39 (7)	27.30 (19)	102.19 (35)	552.53 (71)
Total high-service regions	386.30 (190)	88.87 (194)	11.89 (99)	26.0 (255)	96.65 (451)	335.53 (504)
Low-service region						
C	988.64 (87)	194.48 (67)	17.88 (23)	32.32 (35)	73.83 (33)	492.89 (104)
B	1435.48 (89)	124.16 (46)	20.38 (26)	27.50 (37)	89.07 (55)	399.24 (105)
A	2549.75 (756)	317.11 (391)	22.83 (90)	34.4 (117)	139.88 (205)	954.58 (641)
Total low-service regions	2087.35 (932)	258.73 (504)	21.4 (139)	32.4 (189)	115.81 (293)	742.03 (850)
Rate ratio[a] (95% CI)	6.57 (5.58, 7.72)	2.96 (2.51, 3.50)	1.80 (1.39, 2.33)	1.25 (1.03, 1.51)	1.20 (1.04, 1.39)	2.31 (2.06, 2.59)

Note. CI = confidence interval. Number is the total number of hospitalizations for that disease.
[a]High- vs low-service regions.

increased disease rates associated with lower levels of in-home water service for infections caused by *S aureus,* MRSA, and hospitalizations for skin infections ($P<.001$ for each; Table 4). The risk of skin infections was substantially higher among persons from villages with the least water service than for those villages with the highest water service for each of *S aureus* infections (RR=5.1; 95% CI=3.0, 8.7), MRSA infections (RR=7.1; 95% CI=3.6, 14.0), and skin infection hospitalizations (RR=2.7; 95% CI=1.8, 4.1; $P<.001$ for each comparison).

DISCUSSION

This is the first study to associate the absence of in-home water service with an increased risk of lower respiratory tract and skin infections among Alaska Natives. Using aggregated data from regions across Alaska, we found that hospitalization rates for pneumonia and influenza, skin and soft tissue infections, MRSA infections, and childhood RSV were 2 to 4 times higher in regions with a low proportion of homes with water service than in regions with a high proportion of homes with

TABLE 4—Village Demographic Characteristics and Annualized Rates of Respiratory Disease Hospitalizations (Children Younger Than 1 Year) and Soft Tissue Infections (All Ages), by Percentage With In-Home Water Service for Region A: Alaska, 1999–2004, and 1999–2000

Characteristic	Percentage of Community With In-Home Water Service				*P*	
	<10	10–79	≥80	100	For Trend[a]	≥80% vs 100%
Population (% of total)	6956 (30)	4743 (20)	6415 (27)	5459 (23)		
Number of villages	20	13	14	1[b]		
Median village population (range)	312 (49-1042)	370 (96-651)	493 (202-832)	5459	.31	Not tested
Average no. persons per home[c]	4.7	4.2	4.2	4.2	.09	Not tested
Average household income, $ per year	30 633	28 393	31 160	57 321	.87	Not tested
Infections, hospitalization rate (no.[d])						
All LRTI	351 (338)	304 (121)	282 (218)	227 (141)	.002	.02
Pneumonia LRTI	238 (229)	201 (80)	185 (143)	130 (81)	.007	.006
RSV-positive	140 (135)	118 (47)	113 (87)	93 (58)	.08	.24
Pneumonia RSV	78 (75)	63 (25)	63 (49)	51 (32)	.23	.34
Staphylococcus aureus infection, any	13.8 (55)	10.8 (43)	2.7 (17)	8.4 (46)	<.001	<.002
MRSA infection, any	11.3 (45)	7.3 (29)	1.6 (10)	5.5 (30)	<.001	.01
Hospitalized for skin infection	12.8 (89)	9.6 (45)	4.8 (30)	5.5 (30)	<.001	.61

Notes. LRTI = lower respiratory tract infection; RSV = respiratory syncytial virus; MRSA = methicillin-resistant *Staphylococcus aureus*.
[a]Trend among villages excluding largest town in region.
[b]Largest town in region.
[c]Averages are weighted by village population size.
[d]Number is the total number of hospitalizations for that disease.

water service. Although suggestive, this relation was not entirely consistent and was influenced greatly by high hospitalization rates within region A. However, within region A, we undertook a closer look at disease rates by village-level water service and found that villages with the lowest level of water service (less than 10% of homes served) had the highest hospitalization rates for respiratory infections among infants and for skin and soft tissue infections among persons of all ages. The hospitalization rates demonstrated a typical dose–response group relation in which lower rates were related to progressively higher levels of in-home water service.

Because of the study design, these data fall short of establishing a causal relation between water service and infectious disease risks. However, the strength of the association, the dose–response group relation within region A, and the biological plausibility all support the conclusion that pressurized, in-home water service is an important determinant of health status and contributes to reducing transmission of these communicable diseases.

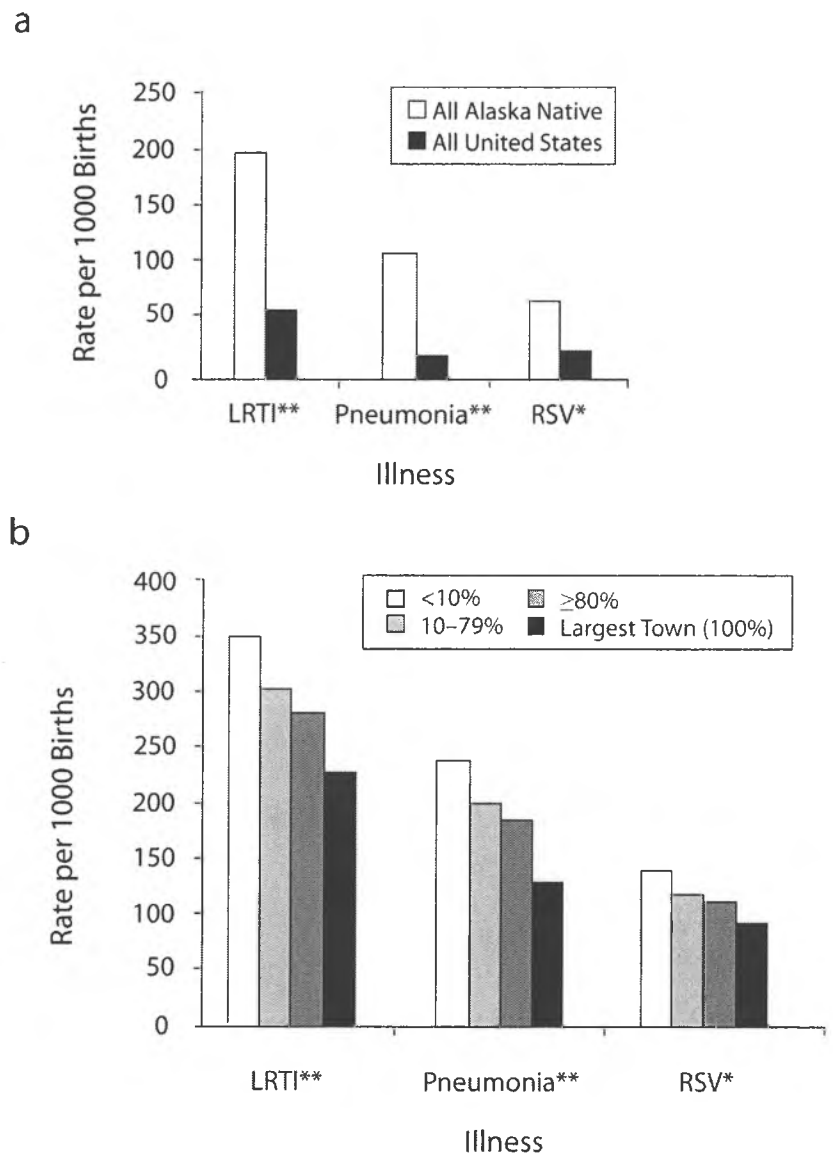
The infectious diarrheal hospitalization rate among Alaska Natives was similar to that among the general US population and did not differ significantly by water service.[20,21] This may seem unexpected because high diarrheal disease rates are seen in other populations that lack in-home water and wastewater service. However, gastrointestinal disease morbidity and mortality among American Indian and Alaska Native populations has been declining since the 1950s.[13,20] The current low rates are likely because of the availability of safe drinking water in nearly all villages (even those with no in-home water service); the relatively cold source water, which does not support propagation of waterborne bacterial pathogens; and the population's overall good nutritional status.

The diarrheal hospitalization rates were in stark contrast to the disparities noted for respiratory and skin infection rates in lower–water service villages. Particularly disturbing was the 5-times higher rate of LRTI hospitalizations and 11-times higher rate of pneumonia hospitalizations among infants in low-service villages in region A compared with the general US population.[17,18] Because infant pneumonias in region A have been identified as a precursor to chronic respiratory diseases such as bronchiectasis and chronic productive cough, many of these children will likely have ongoing health problems because of these infections.[22,23]

Because respiratory and skin infections are not typically contracted through water, the higher rates in low-water-service villages may appear paradoxical. This is best explained by the important role water plays in preventing respiratory and skin infections through handwashing and other personal hygienic measures.[24] It is known that the availability of pressurized, in-home water service increases both water consumption and hygiene practices.[6,25] Thus, the availability of potable water appears to have stabilized waterborne disease rates in Alaska, but it is the water-washed diseases that remain health threats for villages lacking in-home water service. Our findings are consistent with other studies that have shown an association between handwashing and respiratory infectious diseases.[7–9]

Limitations

Some limitations should be considered when one interprets these data. Because of the study design, we cannot be certain that



Note. Comparison rates for all Alaska Natives and all United States from references 17 and 18.
[a]Region A's largest town had water service in almost all homes and was analyzed separately.
*$P = .08$ for trend, region A; **$P < .05$ for trend, region A.

FIGURE 1—Hospitalization rate among infants for lower respiratory tract infections (LRTI), pneumonia, and respiratory syncytial virus (RSV) in region A compared with all Alaska Native and US infants, by percentage of village homes with water service: Alaska, 1999–2004.

these associations arose from a cause-and-effect relationship. Water service may be a marker for other factors related to these health outcomes. When comparing regions, we could not control for factors such as income, village size, and crowding that might have confounded the associations. However, within region A, these characteristics were either similar across villages or were accounted for. The sanitation survey preceded some of the illness data; thus, some relevant water service improvements may not have been included. This could have led to overestimation of water service differences. In the region A analysis we accounted for this by removing villages that had received water service improvements over the study period. Finally, our study did not include data on outpatient respiratory or gastroenteric infections, personal hygiene practices, water quality, water quantity, or the different water delivery systems in use.

Conclusions and Recommendations

In 1954, Public Law 83-568 established the US Public Health Service Indian health program (later named the Indian Health Service) as responsible for improving the health of Alaska Native people. At that time, infectious diseases caused 46% of all Alaska Native deaths. Providing potable water and safe wastewater disposal services for Alaska Native communities was a primary objective.[26]

The IHS, along with the State of Alaska, US Environmental Protection Agency (EPA), US Department of Agriculture Rural Development Program, and Alaska's Tribal Health Organizations, has worked to increase the proportion of rural Alaska homes with modern sanitation service from less than 10% in 1950 to 84% in 2006 (W. Griffith, Village Safe Water Program, written communication, April 2006).

Sanitation improvements have been credited with contributing to the dramatic improvements in Alaska Natives' health.[4] However, substantial progress must be made to bring sanitation service in rural Alaska up to the modern standard enjoyed by 99.4% of the US population. The EPA has established the goal of providing modern sanitation services for 94% of rural Alaskan homes by 2011 (D. Wagner, Alaska EPA Drinking Water Program, written communication, April 2006). Even if this can be achieved, it will leave many rural Alaskans with substandard water and sanitation facilities.

Our study indicated that in-home water service is an important determinant of health in rural Alaska communities. Lower levels of water services were associated with a higher burden of hospitalizations for pneumonia and influenza, skin infections, and LRTIs. This finding was suggested by data in region-to-region analyses and is strongly supported by the village comparisons within region A.

These health disparities were borne disproportionately by Alaska Native infants, children, and elderly who resided in low-water-service villages. Of particular concern was that

up to one fourth of region A infants were hospitalized annually for respiratory infections.

Further prospective studies could assess the relative contributions of hygienic practices, the volume of water used, and the water distribution system while accounting for potential confounding factors and the economic benefits of in-home water service for prevention of infectious diseases. Although those data would be helpful, we believe that the long-recognized value of in-home service along with the data from our study are convincing enough that programs should proceed with adequate support toward a goal of providing modern water and sanitation service to each home in rural Alaska villages. ■

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This article was accepted September 12, 2007.

Note. *The findings and conclusions in this article are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.*

Contributors

T. W. Hennessy originated the study, supervised its conduct, conducted analyses, and was the principal writer. T. Ritter originated the study, analyzed water use data, and wrote sections of the article. R. C. Holman conducted analyses related to water use and regional hospitalization rates and assisted with writing. D. L. Bruden conducted analyses related to water use and disease rates within region A and assisted with writing. K. L. Yorita was involved in data preparation and analysis for water use and regional hospitalization rates and assisted with writing. L. Bulkow provided population data and oversaw the statistical analyses. J. E. Cheek originated the study. R. J. Singleton provided and analyzed data on respiratory hospitalization, assisted with writing, and participated in interpretation of the data. J. Smith was involved in the design and oversaw the water use data acquisition and analysis.

Acknowledgments

We acknowledge Ryan DeLuche, Sue Ehrhart, and Edna Paisano of the Indian Health Service for their technical assistance; the staff who collected the Rural Alaska Housing Sanitation Inventory data; and the staff at the hospitals and clinics in the Alaska Native Health Services.

Human Participant Protection

Institutional review board approval for this study was obtained from the Centers for Disease Control and Prevention and the Alaska Area institutional review board of the Indian Health Service for the respiratory hospitalization data in region A. The hospital discharge administrative and disease outbreak data were determined to be exempt from review because they lacked patient identifiers and were obtained in a public health response to a disease outbreak, respectively.

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Invasive Pneumococcal Disease in Alaskan Children

Impact of the Seven-Valent Pneumococcal Conjugate Vaccine and the Role of Water Supply

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Background: Alaska Native (AN) children, especially those in the Yukon-Kuskokwim region (YK-AN children), suffer some of the highest rates of invasive pneumococcal disease (IPD) in the world. Rates of IPD declined after statewide introduction of the 7-valent pneumococcal conjugate vaccine (PCV7) in 2001, but increased in subsequent years.

Methods: Population-based laboratory surveillance data (1986–2007) for invasive *Streptococcus pneumoniae* infection in Alaskan children <5 years old were used to evaluate the association of IPD rates and serotype distribution with immunization, socioeconomic status, and in-home water service.

Results: Introduction of PCV7 vaccine resulted in elimination of IPD caused by vaccine serotypes, but was followed by increasing rates of IPD caused by nonvaccine serotypes. Among YK-AN children IPD rates dropped by 60%, but then rose due to non-PCV7 serotypes to levels 5- to 10-fold higher than rates in non-YK-AN children and non-AN children. IPD rates in YK-AN children were twice as high in villages where <10% of houses had in-home piped water compared with villages where more than 80% of houses had in-home piped water (390 cases/100,000 vs. 146 cases/100,000, $P = 0.008$).

Conclusions: High IPD rates in Alaska are associated with lack of in-home piped water (controlling for household crowding and per capita income). The effect of in-home piped water is most likely mediated through reduced water supply leading to limitations on handwashing.

Key Words: invasive pneumococcal disease, water, pneumococcal conjugate vaccine, *Streptococcus pneumoniae*

(*Pediatr Infect Dis J* 2010;29: 000–000)

Nearly 50% of Alaskans live in the Anchorage metropolitan area, but one-third of the remaining population lives in small rural communities of 50 to 1000 persons dispersed throughout the remainder of the state. Alaska Native (AN) people comprise approximately 20% of the population and are the predominant inhabitants of small communities in the northern and western regions of the state.[1] These communities are not connected by a highway system, and many do not have piped water systems.

High rates of serious pneumococcal disease were recognized several decades ago in Alaska.[2] Rates of invasive pneumococcal disease (IPD) in AN children in the Yukon-Kuskokwim region in western Alaska (YK-AN children) are among the highest in the world.[3] Subsequent evaluations confirmed high rates of disease in other AN children, and identified a significant disparity in rates between AN children and non-AN children. For example, the rate of culture-positive pneumonia in AN children <2 years old was 10-fold higher than that of non-AN children <2 years old.[4]

Underlying diseases (eg, immunosuppressive disorders, congenital abnormalities, chronic lung disease, or prematurity) as well as behavioral risk factors (eg, day care attendance, household crowding, and lack of breast-feeding[5–7]) contribute to increased risk of IPD in children.[4,5,8–10] However, no combination of these previously identified risk factors explained a health disparity of the magnitude observed in Alaska, which was consigned to ". . . unexplored social, . . . and environmental factors."[4] Two recent studies from Alaska demonstrated that lack of in-home piped water (ie, hauling of water to and waste from the home) was associated with higher rates of hospitalization for respiratory diseases.[11,12]

Introduction of 7-valent pneumococcal conjugate vaccine (PCV7) in early 2001 raised hopes of addressing IPD in Alaska populations, despite underlying causes. IPD caused by serotypes present in the vaccine decreased rapidly, narrowing the disparity between AN children and non-AN children but IPD rates caused by nonvaccine serotypes increased subsequently, specifically in AN children less than 5 years old.[13]

We evaluated IPD surveillance data from Alaska through 2007 to further characterize the impact of PCV7 vaccine introduction, and to evaluate potential associations between socioeconomic indicators, water supply, and IPD in the postvaccine era.

METHODS

Invasive Disease Surveillance

Since 1986, cases of IPD (defined as isolation of *S. pneumoniae* from a normally sterile site in an Alaska resident) are reported from clinical laboratories throughout Alaska to the CDC's Arctic Investigations Program (AIP) in Anchorage. Isolates are sent to AIP where identification, serotyping, and antimicrobial susceptibility testing are performed using standard methods. Annually, participating laboratories compare their records with a list of isolates received by AIP and report any missing cases.

Data on cases are collected from clinical laboratories, medical records, or the patient's clinician, and include demographic information, clinical syndrome and outcome. We report data on cases of IPD in children aged <5 years in Alaska identified between January 1, 1986 and December 31, 2007. We studied 3 specific time periods to assess impact of PCV7 and characterize disease in the conjugate vaccine era. Time periods were defined as:

- Period 1, prevaccine introduction (1996–2000).

Accepted for publication August 24, 2009.

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ISSN: 0891-3668/10/2903-0001

DOI: 10.1097/INF.0b013e3181bdbed5

- Period 2, early vaccine period (2001–2004), during which rates in both AN children and non-AN children dropped below the lowest rates in period 1.
- Period 3, late vaccine period (2005–2007) during which rates in both AN children and non-AN children rose above period 2 nadirs.

Socioeconomic Factors and Water Supply Data

The Rural Alaska Housing Sanitation Inventory documented in-home water service in rural areas of Alaska between 2001 and 2004. We obtained data on factors potentially associated with IPD (household size, income data, percent of homes heated with wood, and water service in villages/cities not in the inventory) at the village level from the 2000 US Census.[1] In-home water service was defined as pressurized water service within the household, either from a centralized piped water service system or a closed haul system. In a closed haul system, water is delivered to an external holding tank and distributed throughout the household in pressurized pipes. We calculated the percent of households with water service by AN health care system regions. In YK, we categorized villages (N = 55) into low service (<10% of households served), midlevel service (10%–<80% of households served), and high service (≥80% of households served).

Vaccination Coverage

We obtained the coverage rate with 3 doses of PCV7 in 19- to 35-month-old children in the United States population overall, and for Alaskan children by race from the National Immunization Survey public use files for July 3, 2003 through June 3, 2007.[14] We obtained coverage data for AN children by region from computerized health records for AN children.

Statistical Analysis

Vaccine coverage is presented with the 95% confidence interval for a binomial proportion. Statistical analyses and comparisons of rates and proportions between study periods were evaluated using the χ^2 test (Mantel-Haenszel). *P*-values are exact where appropriate and 2-sided. All statistical analyses were conducted using SAS 9.2 (SAS Institute, Cary, NC), EpiInfo 3.5 (Centers for Disease Control, Atlanta, GA).

We used a multivariate analysis of variance model (MANOVA) to test if 3 potential risk factors (household size, per capita income, and water service level) jointly differed between YK and other regions. The unit of analysis was village/city. The city of Anchorage was presented separately for IPD rates and socioeconomic factors. It was not included in the MANOVA as it was the only unit of analysis in the region. We tested IPD rates among YK villages with different levels of water service by use of a trend test for Poisson rates.[15] We adjusted and tested for confounding of socioeconomic factors by the use of Poisson regression.

RESULTS

Vaccination Coverage

Among AN children, coverage with 3 doses of PCV7 in 19- to 35-month olds rose from 93% (95% CI: ±6.3%, July 2003–June 2004) to 98% (±3.6%, July 2006–June 2007).[14] Vaccine coverage in Alaska white nonhispanic children rose from 65% (±9%) to 90% (±5%) while coverage with 3 doses of PCV7 vaccine in the United States population rose from 71% (±1%) to 89% (±1%)[14] during the same time periods. Among YK-AN children, coverage rose from 95% to 98% during the same time periods (AN health system data).

Overall IPD Rates in Alaskan Children

IPD rates in Alaskan children <5 years of age are shown in Figure 1. IPD in all Alaskan children declined from 97 cases/100,000 per year in the prevaccine period (period 1) to 41/100,000 in period 2 ($P < 0.002$), and then rose to 63/100,000 in period 3 ($P < 0.002$, period 2 vs. period 3). Rates of disease in AN children were 2- to 5-fold higher than in non-AN children during period 1. IPD rate disparities disappeared in 2001, when PCV7 was introduced, but re-emerged later, with rates in AN children 3 to 5 times higher than those in non-AN children ($P < 0.001$).

IPD Rates by Ethnicity, Setting, and Vaccine Type Status

Table 1 shows rates of IPD, IPD caused by vaccine serotypes, and nonvaccine serotypes. Among AN children, rates of vaccine type disease were highest in YK. YK-AN children also had the highest rates of nonvaccine type disease before introduction of PCV7. Vaccine-type disease disappeared in all population groups. IPD due to nonvaccine serotypes increased in both AN children and non-AN children in recent years. Following an initial postintroduction decline in YK, rates of nonvaccine type IPD increased more than 3-fold ($P < 0.0001$, period 3 vs. period 2, Table 1). In all other population groups (except urban AN children) nonvaccine type IPD in period 3 also increased significantly ($P < 0.02$ for comparisons of period 1 vs. period 3).

Serotype Distribution

Serotypes causing at least 90% of IPD in Alaskan children during each period are shaded in Table 2. In period 1, 11 serotypes caused 92% (201/219) of all IPD. In period 2, the most common 18 serotypes (causing 93% (71/76) of all IPD) included 8 of the 11 major serotypes in period 1 plus an additional 10 serotypes present previously, but which had not caused substantial amounts of disease. In period 3, three non-PCV7 serotypes (19A, 7F, and 6A), each among the 11 most common causes of IPD in period 1, caused 56% of all IPD. An additional 22% of all disease in period 3 was caused by serotypes that emerged as significant contributors to IPD in period 2. Serotypes included in the 13-valent pneumococcal conjugate vaccine under development caused 67% of IPD in period 3.

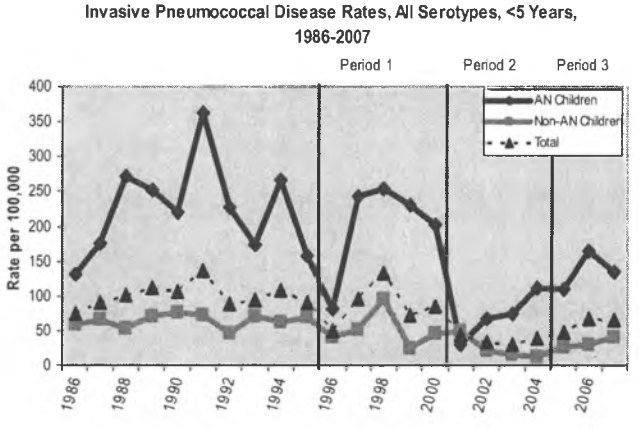

FIGURE 1. Invasive pneumococcal disease (IPD) in Alaskan children less than 5 years of age, 1986 to 2007, cases/100,000 children/y. Total rate (lines with triangles), rate in non-Alaskan Native children (lines with boxes) and rate in Alaskan Native children (lines with diamonds).

TABLE 1. Rates of Invasive Pneumococcal Disease (IPD) by Race, Geographic Location and Time Period, Alaskan Children <5 Year of Age

	Period 1, 1996–2000	Period 2, 2001–2004	Period 3 2005–2007	*P* Period 1 vs. 2	*P* Period 2 vs. 3
Rate of total IPD (cases of IPD/100,000 children <5)					
All	97 (242)*	41 (83)	63 (101)	<0.001	0.003
Alaska native–all	227 (135)	77 (42)	142 (62)	<0.001	0.002
YK	547 (81)	148 (18)	426 (40)	<0.001	<0.001
Other rural	87 (25)	59 (16)	87 (18)	0.2	0.3
Urban	182 (29)	53 (8)	30 (4)	0.001	0.3
Alaska non-native–all	56 (107)	27 (41)	32 (37)	<0.001	0.5
Rural	34 (18)	26 (11)	24 (8)	0.5	0.9
Urban	65 (89)	28 (30)	34 (29)	<0.001	0.4
Rate of IPD caused by serotypes in PCV7 (cases of PCV 7 serotype IPD/100,000 children <5)†					
Alaska native					
YK	344 (51)	8 (1)	0	<0.001	0.4
Other rural	70 (20)	11 (3)	10 (2)	<0.001	0.9
Urban	133 (18)	0	0	<0.001	—
Alaska non-native					
Rural	28 (15)	7 (3)	0	0.02	0.1
Urban	49 (67)	11 (12)	0	<0.001	<0.002
Rates of IPD caused by serotypes not in PCV7 (cases of non PCV 7 serotype IPD/100,000 children <5)†					
Alaska native					
YK	142 (21)	124 (15)	405 (38)‡	0.7	<0.001
Other rural	14 (4)	47 (13)	77 (16)‡	<0.02	0.2
Urban	38 (6)	47 (7)	30 (4)	0.7	0.5
Alaska non-native					
Rural	5.7 (3)	19 (8)	24 (8)‡	0.06	0.6
Urban	10 (14)	13 (14)	34 (29)‡	0.5	0.002

*Number of cases in parentheses.
†Serotype specific rates represent cases in which serotype information is available.
‡Rate in period 3 significantly greater than rate in period 1, $P < 0.02$.

Clinical Presentation

The proportion of AN children IPD case-patients with pneumonia rose from 62% (period 1) to 71% (period 3, $P > 0.05$). A higher proportion of YK case-patients had pneumonia (80%) than AN children from outside of YK (54%, $P < 0.01$). The proportion of non-AN children case-patients with pneumonia rose from 17% in period 1 to 30% in period 3 ($P = 0.05$). AN children case-patients were more likely to have pneumonia than non-AN children in each time period ($P < 0.01$), while non-YK AN children did not differ significantly from non-AN children. Seven to 15% of case-patients had meningitis, with no significant difference by race or time period. The case fatality rate ranged from 1.7% to 2.5%, with no significant difference by race or time period.

Underlying Diseases

Information on underlying diseases was available for at least 94% of patients in periods 2 and 3, but only 39% of patients from period 1. Among those with information, 12%, 18%, and 38% reported underlying diseases in periods 1, 2, and 3, respectively ($P < 0.01$ for period 1 or 2 compared with period 3). During periods 2 and 3,YK-AN children were more likely to report an underlying illness (22% and 49% for period 2 and period 3, respectively) than non-YK-AN children (21% and 43%, respectively), or non-AN children (10% and 19%, respectively) though the differences between population groups within a time period are not statistically significant.

Asthma was a common underlying disease reported for YK-AN children (11% and 24% of YK-AN children in periods 2 and 3, respectively). In contrast, 8% and 4% of non-YK-AN children cases reported these diseases in period 2 and 3, respectively, and 2% and 8% of non-AN children cases reported asthma during the same time periods. The only other commonly reported underlying disease, congenital anomalies or abnormalities, was reported in 5% to 13% of each group in period 2 and 15% to 17% of each group in period 3. Thus, the increase in proportion of children with an underlying disease is likely attributable to both (1) a general increase in reporting underlying disease and (2) an increasing proportion of all cases occurring in YK-AN children (22% of cases in period 2 and 41% of cases in period 3), in whom asthma was more commonly reported in all periods.

Geographic Variation in IPD Rates and Socioeconomic Risk Factors for IPD

IPD rates in the postvaccine era (periods 2 and 3 combined) varied widely among geographic regions in Alaska (Table 3). YK had significantly higher rates of IPD (267 cases/100,000 children <5) than the 3 next highest regions (67, 94, and 80/100,000, $P < 0.0001$), which in turn had higher rates of IPD than other regions (all <45/100,000, $P = 0.004$). YK had the lowest average annual per person family income and the highest number of average persons per household (Table 3). YK also had the smallest proportion of houses with piped, in-home water service (61%). YK differed significantly in water service level, household size, and per capita income from the other regions (MANOVA, $P < 0.01$).

Within YK communities identified as having low water service the rate of IPD was 391/100,000 children <5 years old; communities with midlevel water service had a rate of 263/100,000 and communities with high water service had a rate of 147/100,000 (*P*-for trend = 0.008, Table 4). The association between IPD rate and water service remained statistically significant when stratified by income per person, median family income, median household size, and proportion of houses heated with wood ($P < 0.02$ for each comparison, data not shown).

DISCUSSION

IPD decreased in Alaska immediately after introduction of PCV7, but increased in subsequent years, especially in YK-AN

TABLE 2. Most Common *S. pneumoniae* Serotypes Causing Invasive Pneumococcal Disease (IPD) in Alaskan Children <5-Year-Old by Time Period

Serotype	Period 1: 1996-2000 Cases, (%)	Period 2: 2001-2004 Cases, (%)	Period 3:2005-2007 Cases, (%)
14* (PCV7)	67 (31)‖	7 (9)	-
6B* (PCV7)	30 (14)	4 (5)	-
19F* (PCV7)	27 (12)	2 (3)	-
18C * (PCV7)	15 (7)	2 (3)	-
9V * (PCV7)	12(6)	1 (1)	1 (1)
23F * (PCV7)	11 (5)	3 (4)	1 (1)
19A*	10 (5)	18 (24)	30 (31)
4 * (PCV7)	9 (4)	-	-
6A*	8 (4)	4 (5)	6 (6)
1*	7 (3)	-	-
7F*	5 (2)	2 (3)	20 (20)
38	†	5 (7)	1 (1)
33F	3 (1)	4 (5)	4 (4)
15C	1 (0.5)	3 (4)	1 (1)
22F	3 (1)	3(4)	4 (4)
10A	†	3 (4)	2 (2)
15B	1 (0.5)	3 (4)	1 (1)
12F	†	2 (3)	6 (6)
3*	†	2 (3)	6 (6)
8	†	2 (3)	-
22A	1 (0.5)	2 (3)	1 (1)
23B	†	1 (1)	3 (3)
15A	1 (0.5)	-	2 (2)
16F	†	-	2 (2)
35F	1 (0.5)	-	2 (2)
9N	2 (1)	-	2 (2)
17F	§	1(1)	1 (1)
% of IPD (top 3 serotypes)	58%	41%¶	58%¶
% of IPD (top 5 serotypes)	71%	51%¶	71%¶
% of IPD (top 10 serotypes)	92%	73%¶	86%¶
% of IPD (PCV7 serotypes)	80%	26%¶	2%¶
% of IPD (6 additional serotypes in PCV13)	13%	35%¶	65%¶
% of IPD (PCV13 serotypes)	92%	61%¶	67%¶

*In 13-valent pneumococcal conjugate vaccine.
†Isolated from IPD in Alaskan children <5 yr of age in 86–95.
‡No IPD, but present in carriage specimens from period 1 IPD.
§Isolated from Alaskan adults during period 1.
¶P value <0.05 when compared with previous period.
‖Shading shows rank-ordered serotypes included in cumulative frequency of ≥90%.

TABLE 3. Water Supply, Socioeconomic Data and Invasive Pneumococcal Disease (IPD) Rates (2001–2007) by Region Within Alaska

Region	Total Population Size	Population (<5 Years of Age)	% of Population Alaska Native	No. Villages	Overall Rate of IPD <5 Years of Age (Cases)	Socioeconomic Factors: Proportion of Households With Water Service	Socioeconomic Factors: Median Persons/Household	Socioeconomic Factors: Per Capita Income ($1000)	Socioeconomic Factors: Median Family Income ($1000)
YK	23,415	3024	88%	50	267 (59)	61%	4.7	6.5	33.2
A	7965	900	86%	13	94 (6)	86%	4.4	14.7	58.1
B	9196	1045	79%	17	80 (6)	72%	3.8	9.8	40.9
C	7445	675	73%	26	67 (3)	89%	3.4	17.0	57.4
D	6346	685	71%	7	44 (2)	100%	3.9	17.4	68.2
E	259,889	21,069	10%	1	37 (57)	100%	3.2	20.0	63.7
F	143,494	9693	12%	124	37 (27)	95%	3.3	17.8	56.9
G	96,228	7970	14%	66	29 (16)	92%	3.1	14.9	46.8
H	72,954	4743	22%	43	25 (8)	95%	3.1	19.8	62.4

children. By 2007, IPD rates in YK-AN children were again 5 to 10 times higher than in other populations in Alaska. We characterized potential contributors to this persistent increased risk, and identified a significant association of IPD with lack of in-home water supply.

Among Alaska regions, YK has the lowest per capita income, the largest households and the lowest proportion of villages with a piped water supply. Within YK, lack of piped water was significantly associated with risk of IPD (controlling separately for per capita income, household crowding, and wood heating in the home). The most likely explanation for such an effect is that reduced availability of water decreases handwashing, leading to increased transmission of respiratory pathogens. A randomized trial of handwashing in Pakistan showed 50% lower rates of lower respiratory tract infection in the hand-washing group.[16] Reduction in risk of respiratory disease was associated with handwashing in a military population,[17] for SARS transmission,[18] and for respiratory infections in general.[19] For IPD, the implications of increased person-to-person transmission of respiratory pathogens may be 2-fold–(1) enhanced spread of pneumococcal colonization and (2) increased transmission of other respiratory viruses that could facilitate development of IPD among persons colonized with pneumococci. The impact of water supply on IPD appears to be unrelated to water purity or contamination. Neither study identifying water supply as a risk factor for increased rates of hospitalization for skin and respiratory infection in Alaska found an associated increase in diarrheal diseases.[11,12]

TABLE 4. Rates of Invasive Pneumococcal Disease (IPD) in Children <5 yr of Age in YK, 2001–2007 by Water Service Level and Socioeconomic Factors

Socioeconomic Factor	Socioeconomic Level	IPD Rate (Cases/100,000 per Year)	Univariate *P*
Water service	<10%*	390.9	0.008
	10%–80%*	262.9	
	80%+*	146.7	
Income per person	<$6000 per year	286.3	0.71
	≥$6000	256.6	
Median family income	<$32,000 per year	302.6	0.33
	≥$32,000	232.4	
Household size	≥5 persons	345.0	0.06
	<5 persons	199.2	

*Of homes served with running water.

The retrospective, observational nature of our study limits our ability to conclusively define the role of water supply in IPD in Alaska. It is possible that the elevated risk we identified represents the impact of other factors associated with water supply. Data from other sources provides some information on the potential role of other putative risk factors. Several studies suggest a slightly higher prevalence of underlying illnesses associated with risk of IPD[6,7,10,20] among AN children, including major birth defect anomalies,[21] low birth weight,[22] and anemia.[23] In period 3, 49% of YK-AN children and 43% of non YK-AN children with IPD reported an underlying disease. While increased rates of children with underlying disease may contribute to increased overall IPD rates, even if all cases reporting underlying disease are removed from the analysis, rates of disease in YK-AN children was still 4-fold greater than the rate in non- YK-AN children. Thus, while presence of underlying diseases increases risk for IPD, they do not explain the increase in rates observed in YK-AN children.

Behavioral risk factors associated with IPD in children include day care attendance, household crowding, lack of breast-feeding, and possibly indoor air pollution, the most likely correlate of which in Alaska is use of wood for heating.[5–7,20,24] Some data is available to address their potential contribution to increased rates of disease in YK-AN children. There are 8 licensed day care facilities in the Southwest region of Alaska, which includes YK. In contrast, there are 5 times more daycare facilities per unit population elsewhere in Alaska.[25] Thus, licensed day care attendance is unlikely to be a major contributor to increased risk of IPD in YK-AN children. Most (76%) women in Southwest Alaska are breast-feeding their babies at 4 weeks postpartum, well within the range of all regions in Alaska (70%–86%), therefore, differential breast-feeding rates do not appear to contribute to the disparity in risk.[26] Finally, according to US Census data, the proportion of homes heated with wood was low in YKD, did not differ significantly among water service categories (range among water service categories, 8.9%–10.5%) and thus did not contribute to the increased risk attributed to lack of in-home water supply. We addressed household crowding and income level directly in the analysis (Results section, and Table 4) and demonstrated that the association of IPD with water supply was independent of these risk factors. Additional study is needed to confirm this association since it is possible that other unidentified covariates may contribute to the apparently increased risk associated with lack of in-home water use. A prospective evaluation of the impact of provision of in-home piped water on infectious diseases in AN people is now underway.

The interaction of several factors led to multiple levels of risk in Alaska (Table 1). In all groups, from YK-AN children (highest risk) to non-AN rural children (lowest risk), introduction of PCV7 was accompanied by rapid disappearance of vaccine-type IPD. In 4 of 5 population groups, disappearance of PCV7 strains was followed by statistically significant increases in rates of disease caused by nonvaccine strains. As a result, the net impact of PCV7 in Alaskan children (where 80% of baseline disease was caused by vaccine type strains) was a 30% decline in IPD. This finding contrasts with the experience in the general US population, where overall disease rates in children <5 years of age fell from 99 to 23 cases/100,000 between 1998 to 1999 and 2004 (a 77% decrease) and rates of nonvaccine type IPD rose minimally.[27] Rates of IPD in White Mountain Apache children less than 2 years old in Arizona decreased from 470 to 120/100,000 after PCV7 introduction, with no increase in nonvaccine type IPD.[28] In Spain and France, countries with substantially lower PCV7 coverage rates, a modest overall reduction in rates of vaccine type IPD (21% and 40% decrease in children <2, respectively), was associated with a marked increase in nonvaccine type IPD rates (85% and 530%, respectively).[29,30] However, both studies noted an overall increase in IPD rates in the postvaccine era, and the impact of concurrent changes in surveillance methodology was unclear.[31] While long-term follow-up from a vaccine efficacy trial in South Africa suggests an increase in nonvaccine serotype IPD, data from other developing countries with population-wide use of PCV7 is not yet available.[32]

Several factors may contribute to the differences observed in nonvaccine serotype IPD in the postvaccine era. High rates of IPD in AN children are propelled by intense transmission of the pathogen and possibly viral cofactors, by household crowding, lack of piped water supply, and other unidentified factors. IPD after PCV7 introduction is likely a function of (1) level and duration of coverage with PCV7, (2) underlying transmission characteristics operating in the population of concern, (3) host characteristics, and (4) invasiveness of existent serotypes.[33] The complex interplay between these and other factors is illustrated by varying patterns of replacement noted in Alaska, the rest of the United States, and western Europe.

Our findings on incidence and serotype distribution are limited by the small population size leading to small numbers of cases and increased variability of the point estimates. Long-term surveillance is important to confirm the trends we identified. It is also possible that variations in surveillance sensitivity exist. However, increased sensitivity would only lead to even more elevated rates of IPD, emphasizing the importance of addressing key risk factors. In addition, the association of IPD with water supply was noted not only across regions (where some variation in surveillance capacity is possible), but also within the highest risk region (where surveillance is uniform), suggesting it is not a surveillance artifact. While IPD rates were available each year, data on crowding and income were projected from the 2000 census, and though changes in these parameters could have occurred over the course of the study, it is unlikely that these parameters changed substantially. Finally, the association between water service and IPD rates was demonstrated at the village level, and may not represent the strength of the association at the individual or household level.

High rates of IPD in Alaska are associated with lack of in-home piped water, an effect most likely mediated through limitations on handwashing. The pattern of emergence of serotypes after vaccine introduction highlights the potential of broader spectrum pneumococcal vaccines and the importance of continued surveillance, especially in developing countries where environmental conditions predispose to high risk of IPD. While develop-

ment of vaccines with broader coverage will undoubtedly reduce IPD burden, addressing infrastructure disparities such as in-home water supply may be a key component for controlling IPD in Alaska and other areas where such risk factors for IPD exist.

ACKNOWLEDGMENTS

The authors thank the clinicians and microbiology laboratory personnel of the hospitals participating in state wide surveillance for IPD in Alaska, as well as serotyping personnel at the AIP laboratory (Marcella Harker-Jones, Julie Morris, and Alisa Reasonover for serotyping the pneumococcal isolates, and Kim Boyd-Hummel for summarizing clinical information on cases. Note: The findings and conclusions in this article are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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Rural Alaska Sanitation
Bush Caucus Briefing

February 17, 2012

Presented by

The Alaska Department of Environmental Conservation
&
The Alaska Native Tribal Health Consortium

Handouts For Discussion:

A. Status of Efforts

B. Types of Water and Sewer Systems

C. Status of Water and Sewer Household Service Delivery in Rural Alaska

D. Population that Would Directly Benefit From Rural Water & Sewer Projects Identified as Meeting Critical Health Needs

E. The Cost of Addressing Needs is Escalating While Funding Declines

F. Water and Sewer Services in Arctic Communities: What makes Alaska different?

G. Construction Project Scoring Criteria

H. Current Agency Coordination Efforts: State and Federal Resources

I. New Technology for Rural Alaska Water and Sewer Needs: An Imperative with No Time to Loose

RURAL ALASKA SANITATION:
Status of Efforts – February 2012

Long Term Progress

As recently as 30 years ago, fewer than 25% of rural Alaska households had running water and flush toilets. In 1996 when the State first began its statewide rural sanitation survey, 55% of rural homes had piped or covered haul service. Today, approximately 75% of rural homes have indoor plumbing. (This estimate omits regional hubs such as Kotzebue and Bethel, as these larger communities tend to skew the analysis.) The progress made in improving rural sanitation conditions is significant, with an average of 1.5% of rural homes receiving first time service per year.

Recent Progress

Because of high levels of federal funding since 2000, work on several community systems was initiated and is now completed or nearing completion. Prior to hooking up homes for the first time, significant design and construction work must take place on core facilities such as water source development, water treatment and storage, and sewage treatment and disposal. The following first-time running water and sewer systems have been under construction for several years, and are currently scheduled to have a total of nearly 2,000 homes connected between 2009 and 2015:

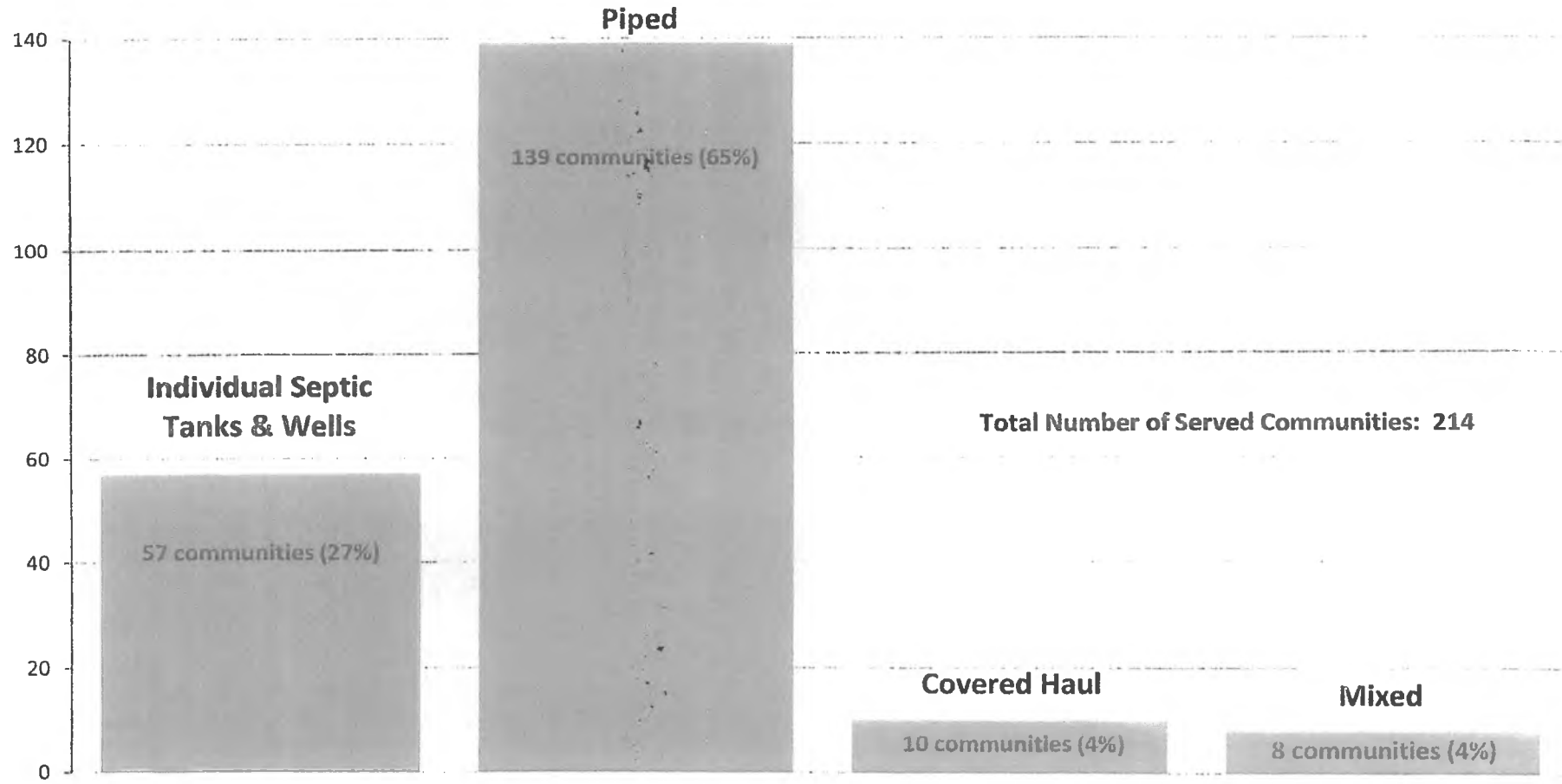
- Akiak
- Buckland
- Chuathbaluk
- Fort Yukon
- Goodnews Bay
- Hooper Bay
- Hughes
- Kasigluk
- Kwigillingok
- Pilot Point
- Pitkas Point
- Nunam Iqua
- Quinhagak
- Slana

State and federal funding invested to date in providing these fourteen villages with running and water and sewer is well over $100 million. Recent decreases in funding levels have slowed progress. Without significant future investments, completion of additional projects will be deferred.

Rural Alaska Sanitation

Types of Water and Sewer Systems

B.



Notes: Data set includes served communities and communities with system construction nearing completion.
A served community is defined as one in which 55% or more of homes are served by a piped or covered haul system.

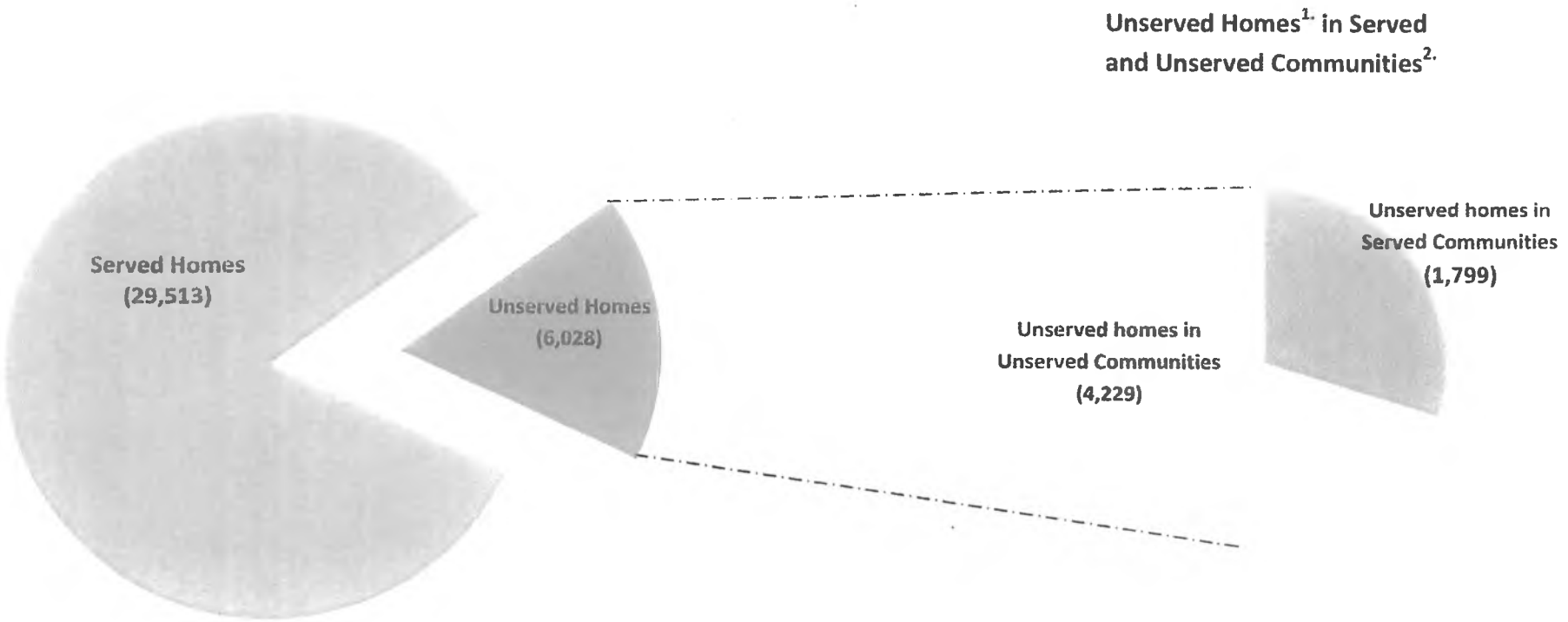
Optimal System: **Individual Septic Tanks & Wells.** Always recommended where soil and water conditions allow.
Second Line Option: **Piped.** Higher capital and operating costs than septic and wells.
Third Line Option: **Covered Haul.** Recommended alternative if individual septic/wells and pipes are not feasible. Often has higher operating costs than piped systems.
Fourth Line Option: **Mixed.** Only recommended when utilization of a single system type is not feasible or practical.

C.

Status of Water and Sewer Household Service Delivery in Rural Alaska

Alaska Department of Environmental Conservation

February 2012



Note: This data is comprised of housing information for all communities that meet federal funding agencies definition of "rural" and includes larger communities and regional hub communities. Only year round occupied homes are included in this data.

1. An unserved home is one which is not connected to an onsite or community piped or closed haul system.
2. An unserved community is one in which less that 55% of residences are connected to an onsite or community piped or closed haul system.

D.

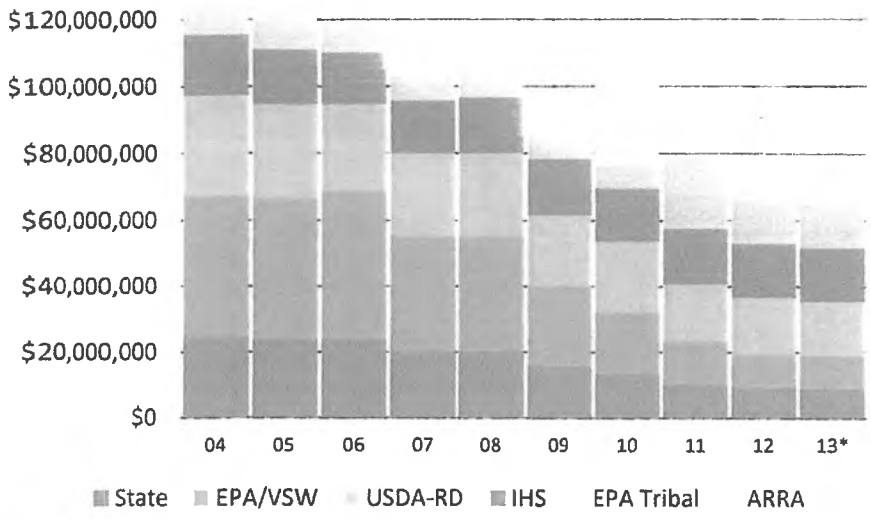
Population that Would Directly Benefit From Rural Water & Sewer Projects Identified as Meeting Critical Health Needs

First Service Projects provide piped or covered haul water and sewer systems to residents in communities that have never had these services. These projects would benefit 14,176 residents in over 40 communities.

Expansion, Upgrade, and Replacement Projects address critical health threats posed by existing systems that have exceeded their original design life, are not meeting health standards, are undersized, or are not serving all residents. These projects would benefit 35,622 residents in over 100 communities.

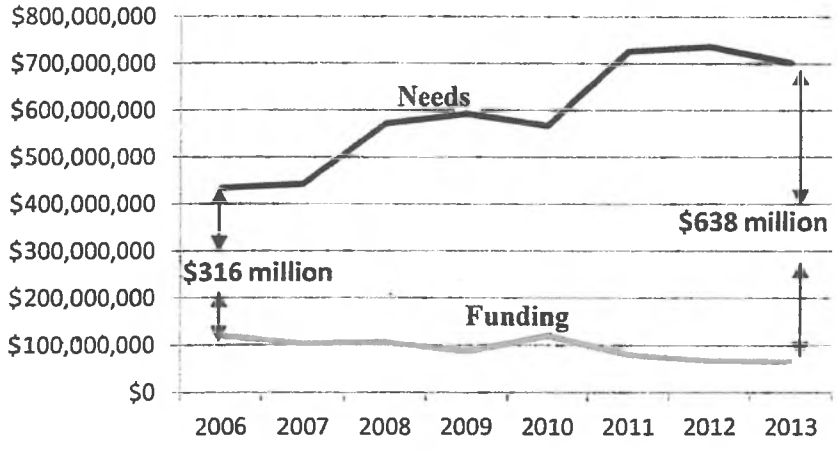
Rural Alaska Sanitation

The Cost of Addressing Needs is Escalating While Funding Declines



Funding for Rural Alaska Sanitation Projects.

Total annual federal and State funding for rural Alaska water and sewer projects has declined by 49% over the last nine fiscal years (from $127 million to an estimated $65 million).

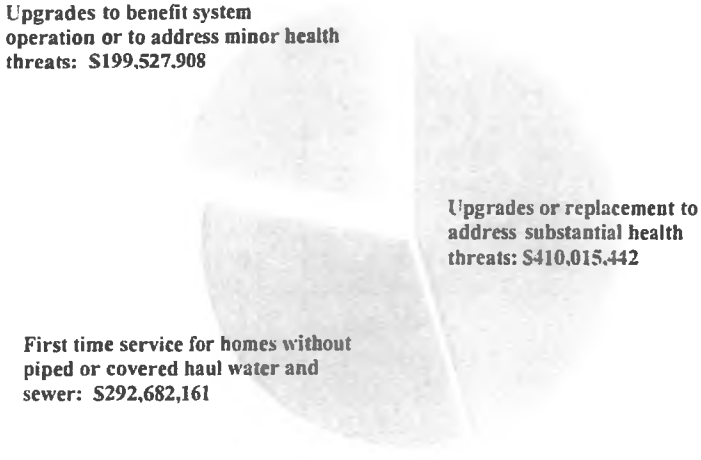


The Growing Gap Between Critical Needs and Available Funding.

While funding has decreased, the cost of addressing critical health related rural sanitation needs (such as homes without running water and flush toilets or inadequately treated drinking water) has increased by over 60% since SFY 2006. This increase is due to a variety of factors including inflation, aging facilities, and more stringent regulations.

The current disparity between available funding and the cost of addressing critical health related needs is approximately $638 million – over a 100% increase since SFY 2006. If funding remains at status quo, this gap will continue to grow exponentially.

**Note: SFY2013 dollar amounts for EPA/VSW and USDA-RD are based on actual appropriations. All other funding amounts are estimates.*



The graph above only includes two types of needs– (1) first time service for homes without piped or covered haul, and (2) upgrades or replacement to address substantial health threats. These two categories are typically combined and referred to as "critical health needs". The above graph excludes a third category of needs - upgrades to benefit system operation or to address minor health threats as these are considered secondary. As shown on the pie chart to the left, these excluded needs amount to approximately $200 million. Also excluded from the above graph and from the pie chart are repair and maintenance needs since these are considered the responsibility of communities and are not eligible for federal funding.

F.

Water and Sewer Services in Arctic Communities: What makes Alaska different?

Alaska Department of Environmental Conservation
February 2012

1. U.S. wastewater and drinking water regulations are the most stringent in the world.

   - Many arctic nations, including Canada, Greenland and Russia, allow raw sewage to be discharged into oceans or rivers.

   - Some other arctic nations allow water to be treated to standards for purposes other than drinking. In the US there is only one regulatory standard – which is for drinking water.

2. The US is one of the only arctic nations that doesn't provide a federal subsidy for operation and maintenance of rural water and sewer systems.

   - The following arctic nations provide some level of subsidy funding for operation and maintenance of water and sewer systems in small, remote villages:
     - Canada
     - Russia
     - Finland
     - Norway
     - Sweden
     - Greenland • into water-
     - Iceland

3. In some arctic nations, including Canada, the federal government chose to consolidate rural populations in order to make service delivery more economical. While this has not taken place in Alaska as a matter of policy, many rural residents have made the decision to relocate in order to have access to improved and more affordable services.

Construction Project Scoring Criteria

Category	Criterion	STATE CIP Points	TRIBAL SDS Points
Health Impact *(limited to one)*	***First Service:*** *Majority of project costs are associated with providing fully piped, closed haul, or onsite water and wastewater service to homes not previously served at the proposed service level.*	*350*	*30*
	Regulatory Compliance: *Majority of project costs are associated with addressing "verified" facility-related regulatory compliance. (DEC drinking water or wastewater program verification Required)*	*300*	*25*
	Essential Upgrades: *Majority of project costs are associated with water/sewer system upgrades or replacement of existing system components that have exceeded their capacity or design life, resulting in present and continuous compromises in health benefits of system and representing a clear and substantial health hazard.*	*175*	*15*
	Beneficial Upgrades: *Majority of project costs are associated with upgrades to increase operational efficiencies or system component upgrades that address intermittent compromises affecting the health benefits of the system. Includes all solid waste improvements.*	*50*	*7*
	Desired Upgrades: *Majority of project costs are associated with upgrades that are not considered "Essential Upgrades" or "Beneficial Upgrades" as defined above.*	*0*	*0*
Project Status & Relationship to other Projects	Project is related to other funded infrastructure project(s)	75	-
	Other existing, mobilized water & sewer project(s) funded and scheduled for construction in 2007	100	-
	Percentage of project cost contributed by agencies other than IHS.	-	8*
Deficiency Level	Initial deficiency level of homes served by project. (Highest deficiency level receives highest points.)	-	18*
Capital Cost	Cost-per-home in comparison with the average unit cost for the provision of all water, sewer, and solid waste services.	-	16*
Tribal Points	Assigned by Regional Health Organizations	-	16*
Application Quality	Information is complete and consistent throughout, and supports the goal of providing safe, sustainable water supply and sewage disposal to community residents.	75	-
Local Capacity	See Local Capacity Scoring Criteria details below	400*	16*
	Total Possible Points	**1000**	**104**

* Maximum number of points available for this criterion. Partial points may also be awarded.

*Local Capacity Scoring Criteria

Category	Criteria	CIP Points	SDS Points
Primary Operator Certification *(limited to one)*	*Primary Operator is certified at the required water treatment level*	*105*	*5*
	Primary Operator is certified for water treatment at any level	*70*	*3*
	Primary Operator is certified for water distribution, or waste water treatment or collection at any level	*20*	*1*
Backup Operator Certification *(limited to one)*	*Backup Operator is certified at the required water treatment level*	*35*	*2*
	Backup Operator is certified for water treatment or distribution, or wastewater treatment or collection at any level	*20*	*1*
Utility & Financial Management	Utility Manager has completed a DCED-Approved Utility Management course or other college-level management training course	35	2
	System is Provisionally Certificated or Regulated by the Regulatory Commission of Alaska (RCA) OR Utility is exempt from regulation *(documentation required)*	50	1
	Collection Rate is 80% or greater *(documentation required)*	50	1
Regulatory Compliance	System is not on the current Significant Non-Compliance List for violation of the Total Coliform Rule	75	3
	System is not on the current Significant Non-Compliance List for violation of any operation-related violation(s)	50	2
	Total Possible Local Capacity Points	**400**	**16**

Current Agency Coordination Efforts: State and Federal Resources

Primary Funding Sources for Sanitation Facilities in Alaska

1. Alaska Funding (75% federal with a 25% State match)
   a. US Environmental Protection Agency (EPA), Alaska Native Village Grants (ANV)
   b. US Department of Agriculture, Rural Development (RD), Rural Alaska Village Grants (RAVG)
2. Tribal Funding
   a. US EPA Safe Drinking Water Act funding
   b. US EPA Clean Water Act funding
   c. Indian Health Service (IHS) funding

State, federal, and tribal agencies are closely coordinated and aligned in Alaska

1. Common database for unmet needs and project information, the Sanitation Deficiency System (SDS) – Updated each summer
2. Common housing information system – Updated each spring
3. Frequent multi-agency meetings to coordinate and align agency activities related to sanitation facilities
4. Multi-agency evaluation and scoring committee – Annual cycle of meetings
   a. Common scoring criteria for all projects
5. Written agreements between all agencies using common language and terminology
   a. Alaska Funding
      a. EPA ANV Funding – 2006 Memorandum of Understanding between:
         i. EPA and the State of Alaska
         ii. State of Alaska and IHS
      b. RD RAVG Funding – 2011 Memorandum of Understanding between:
         i. RD, Alaska Native Tribal Health Consortium (ANTHC), State of Alaska, and IHS
   b. Tribal Funding
      a. EPA Clean Water and Safe Drinking Water Acts
         i. Interagency Agreement between EPA and IHS
         ii. Funding agreements between IHS, ANTHC, State of Alaska
      b. IHS Funding
         i. Funding agreements between IHS, ANTHC, State of Alaska

New Technology for Rural Alaska Water and Sewer Needs:
An Imperative with No Time to Loose

Alaska Department of Environmental Conservation
Village Safe Water Program
February 17, 2012

Background

Over the past half century, more than $2 billion has been spent on improving water and sewer services in rural Alaska. Nearly every Alaska village is now served with some combination of the following four service levels:

- Washeterias and watering points – This service level does not provide water or sewage removal for homes which means that the basic health benefits of running water and and flush toilets are not realized.
- Individual wells and septic systems – These systems are not feasible in most of the state, and wells and septic systems are often located too close together.
- Water and sewer covered haul systems – This service level has high operating costs which often means that homeowners self-limit water use and therefore don't realize many of the health benefits associated with running water and sanitary sewage removal.
- Piped water and sewer systems – This service level provides centralized treatment and storage and piped distribution which requires high construction and operating costs.

Fiscal realities dictate that current approaches to addressing rural Alaska water and sewer needs are no longer achievable or sustainable:

- Many villages still lack running water and sewer or require major improvements to keep their systems operational.
- Current funding is not adequate to serve remaining unserved homes and make improvements to existing systems required for healthy living.
- New technologies are needed to address health problems associated with water and sewer system deficiencies.

New Technology for Centralized Systems: Limited Potential for Cost Reduction

Like nearly everywhere else, when homes in Alaska villages are provided with water and sewer service, it comes from some kind of centralized system. These systems usually have a single source of water that is treated to full regulatory compliance, and stored in a centralized location, usually requiring heat addition. The water is then distributed to homes throughout the community via pipes (usually requiring heating systems), trucks or trailers. Sewage is collected in a similar manner (often requiring heating systems) and is treated and disposed of at a centralized facility. This kind of system is extremely expensive

to build and operate in small, isolated communities. Capital costs routinely exceed $200,000 per home and can cost more than twice this amount. The monthly user cost for operating these systems is often more than 5% of monthly household income in many villages, whereas 1% or 2% is the norm in urban areas.

New technologies for centralized systems are helping to reduce operating costs but not to the extent that current funding levels demand. Energy saving heating and electrical systems, alternative energy, improved monitoring and controls, and more effective water treatment approaches are being employed to an ever-increasing extent, but these improvements can only help to reduce costs to a limited extent. They won't overcome the fundamental challenge of heating water and sewer distribution and collection systems to prevent freezing.

New Technology for Decentralized Systems: High Potential for Cost Reduction

Decentralized water and sewer systems have historically been limited to individual water wells and septic sewage systems. These have a limited range of feasibility in Alaska. Most villages lack adequate ground water and/or the kinds of soil that will work for septic systems.

For most of the past 50 years, alternative individual household water and sewage treatment systems have been considered too complicated and expensive, or simply infeasible in places where maintenance and repair services are not available.

There a number of new water and wastewater treatment, minimization, and recycling technologies that have been developed for such diverse uses as the space industry, recreational vehicles, boats, and disaster response. These proven technologies, along with ones that are not yet available commercially, have great potential for use in rural Alaska homes, multi-family housing, and housing clusters. These technologies could potentially eliminate the need for treating, storing and distributing drinking water. They could also reduce or eliminate the need for wastewater collection and disposal.

In order to identify, evaluate and test the most promising new technologies for use in rural Alaska homes, an innovative and aggressive approach will be needed. This approach will require a high degree of collaboration between the State of Alaska, universities and research centers, and the private sector.

The 2013 Governor's Capital Budget includes $1 million to jump start a comprehensive research and development effort.

Rural Alaska Sanitation
Bush Caucus Briefing

February 17, 2012

Presented by
The Alaska Department of Environmental Conservation
&
The Alaska Native Tribal Health Consortium

Handouts for Reference:

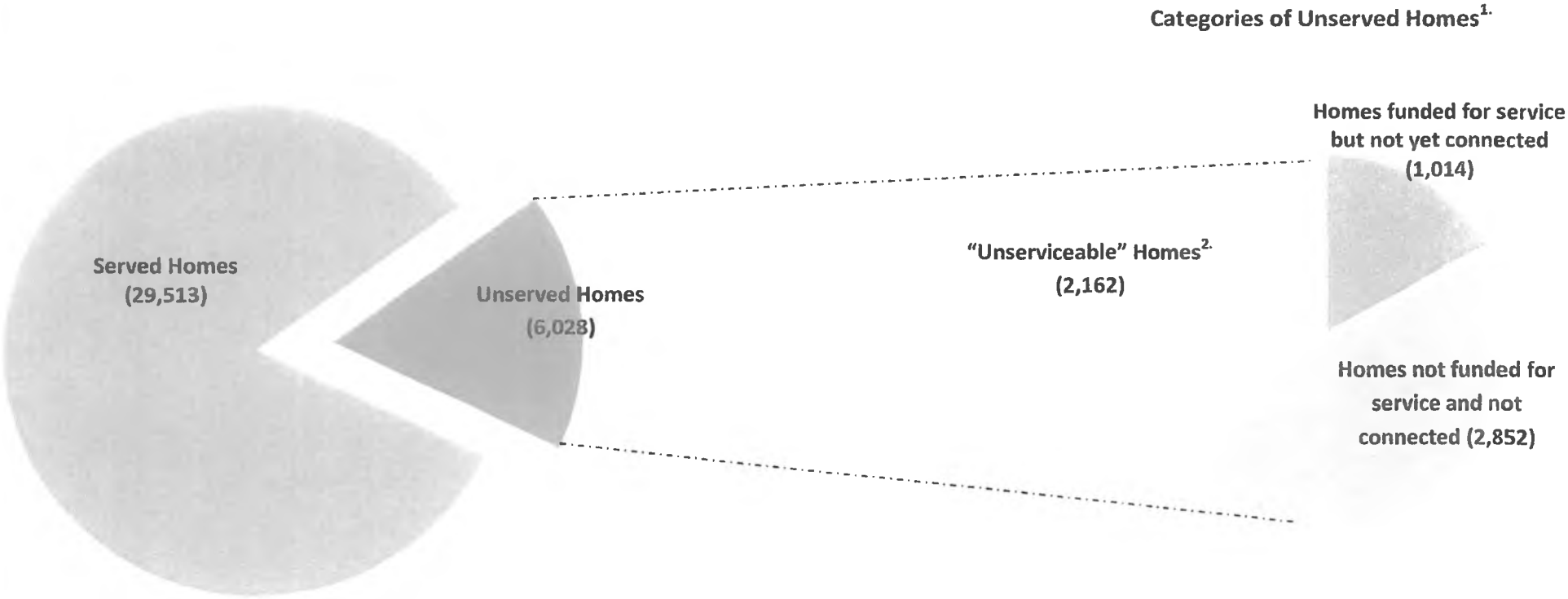
1. Status of Water and Sewer Service Delivery in Rural Alaska – Categories of Unserved Homes
2. Distribution of Unserved Homes by Region
3. Distribution of First Service Needs by Region
4. Distribution of Expansion, Upgrade, and Replacement Needs by Region

Status of Water and Sewer Service Delivery in Rural Alaska

Alaska Department of Environmental Conservation

February 2012

1.

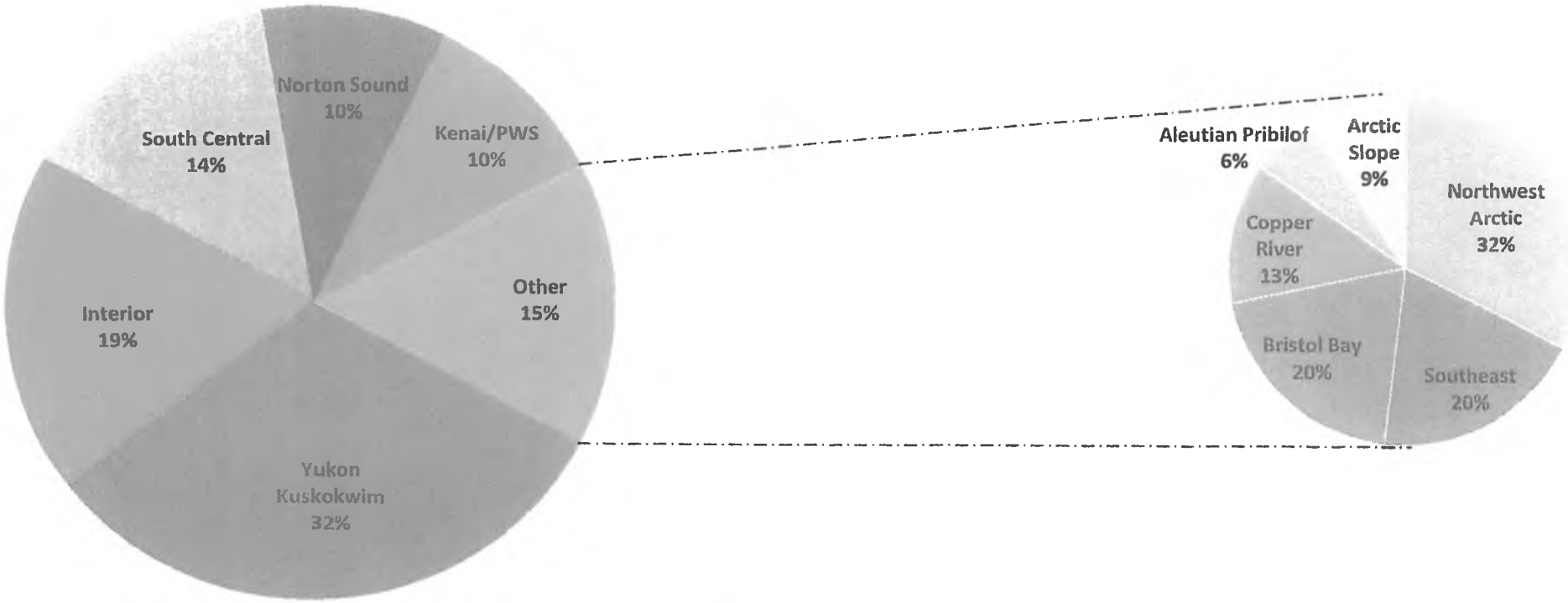


Note: This data is comprised of housing information for all communities that meet federal funding agencies definition of "rural" and includes larger communities and regional hub communities. Only year round occupied homes are included in this data.

1. An unserved home is one which is not connected to an onsite or community piped or closed haul system.
2. An unserviceable home is one that is located in an area where septic tanks and wells are not feasible and is too far away from the "core" area of a community making extending piped service or providing vehicle access for flush/haul vehicles unreasonably expensive.

Distribution of Unserved* Homes By Region Based on Number of Homes

Alaska Department of Environmental Conservation
February 2012



Total Number of Unserved Homes: 6,018

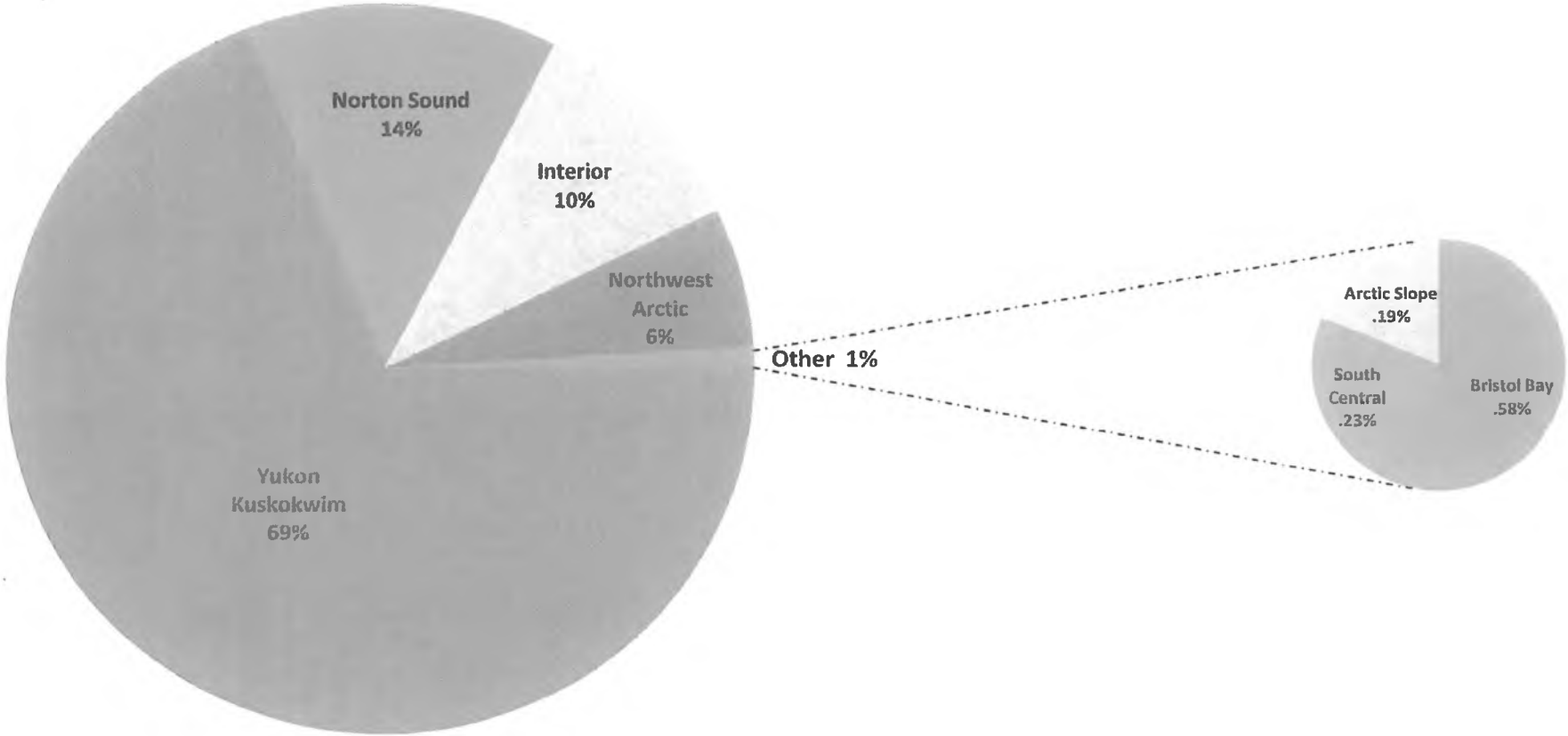
*An Unserved Home is defined as year round occupied house which does not have piped or covered haul water and sewer service.

(Percentages are based on estimated number of unserved homes in each region)

ource: Department of Environmental Conservation and Alaska Native Tribal Health Consortium 2011 House Count.

Distribution of First Service Needs by Region Based on Project Cost

Alaska Department of Environmental Conservation
February 2012



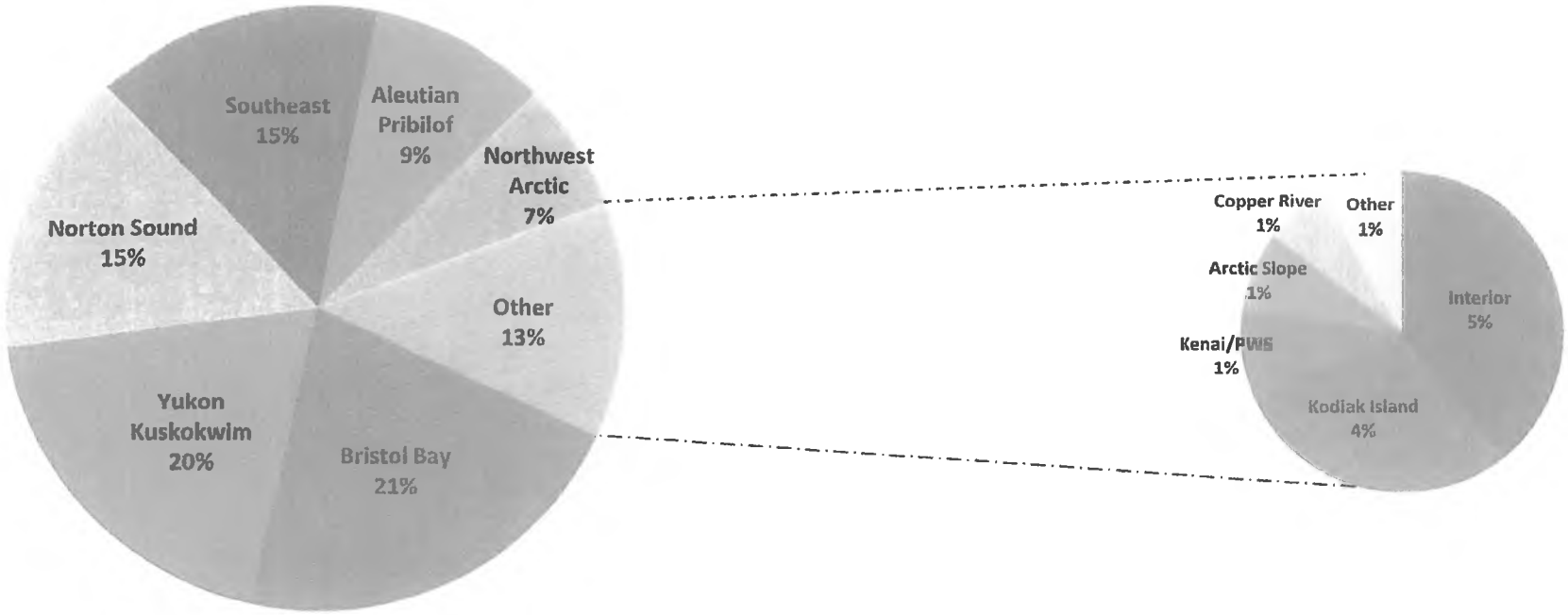
Total Cost to Address First Service Needs (in 2011 dollars): $292,682,161

(Percentages are based on projected costs in each region)

Source: Sanitation Deficiency System, Alaska Area

Distribution of Expansion, Upgrade, and Replacement Needs by Region Based on Project Cost

Alaska Department of Environmental Conservation
February 2012



Total Cost to Address Expansion, Upgrade, and Replacement Needs (in 2011 dollars): $410,015,442

(Percentages based on projected costs in each region)

Source: Sanitation Deficiency System, Alaska Area

- Good afternoon. Welcome to today's C&RA hearing. With me here today is:
  - Senator Kookesh
  - Senator Menard
  - Senator Ellis
- Please turn off all cell phones. This meeting is teleconferenced and recorded.
- On today's agenda, we will consider
  - SB 147 – Water & Sewer Task Force
  - The following administration officials are available for comments and questions,
    - Bill Griffiths – DEC
- Sen. Kookesh and his staff will introduce the bill.
- We will not move this bill today. We will revisit SB 147 next Tuesday for further committee action.

Possible questions for SB 147

- What health concerns are associated with poor sanitation in rural AK?
- TO DEC: What advances in technology do we need to be aware of for water/sanitation systems in rural AK? In other words: what do we know now that we didn't know 30 years ago?
- TO DEC: I have a press release dated July of 2011 that states the USDA awarded $23.6 million. My questions are this: Do these funds pass through Village Safe Water? Do you know the totality of federal funds that have been awarded and received by the state for water & sewer projects from the FEDS?

The C&RA Committee will meet on Thursday to consider SB 183 - PROPERTY TAX EXEMPTION/MILITARY WIDOW(ER)

USDA NEWS RELEASE

United States Department of Agriculture • Office of Communications • 1400 Independence Avenue, SW
Washington, DC 20250-1300 • Voice: (202) 720-4623 • Email: oc.news@usda.gov • Web: http://www.usda.gov

Release No. 0306.11

Contact:
Office of Communications (202) 720-4623

USDA Announces Water and Wastewater Improvement Projects in Alaska

WASHINGTON – July 15, 2011 - Agriculture Secretary Tom Vilsack announced today that 14 communities, many with populations that are predominately Alaska Native, will receive $23.6 million through the Rural Alaska Village Grant program to fund water quality improvement projects in rural Alaska villages. The announcement of funding follows a new Memorandum of Understanding between Rural Development and program partners to improve efforts to provide clean water and improved sanitation services to the villages.

"Rural Development made a commitment to streamline the Rural Alaska Village Grant program and this funding is the result of that commitment," Vilsack said. "Residents of these rural communities will now be able to have running water for cooking, cleaning and laundry that most people take for granted."

The Memorandum of Understanding is the result of an initiative launched by USDA in April of 2010 through a Rural Alaska Village Grant (RAVG) Process Improvement Conference in Anchorage. The conference was attended by representatives from USDA, Alaska's Department of Environmental Conservation (DEC), Alaska Native Tribal Health Consortium, U.S. Environmental Protection Administration (EPA), Indian Health Service and the Denali Commission and focused on ways to improve communication, simplify the application process and maintain grant funds accountability.

The inter-agency collaboration has produced results throughout the streamlining initiative. In 2009 and 2010 USDA invested more than $65 million in RAVG construction and planning projects.

For example, the community of Old Kasigluk will use grant funds to construct core facilities, including a water treatment plant, washeteria, a water storage tank, lift station, and a sewer force main to transport wastewaster directly to a recently constructed sewage lagoon. The washeteria, a centralized running-water facility, will provide the residents of Old Kasigluk, a rural community in southwestern Alaska, with access to clean water for cooking, cleaning and washing. The improvements are the first upgrades needed to provide the community with quality sanitary services and replace structurally unsound facilities that can no longer be used. The residents of the community currently haul water and dispose of wastewater by utilizing "honey" buckets.

Communities receiving grant funds under this announcement include: Toksook Bay, $5,252,400; Stebbins, $5,064,367; Kasaan, $3,393,750; Togiak, $937,509; Old Kasigluk, $4,082,250; Shungnak, $1,492,500; Nunam Iqua, $137,655; Igiugig, $1,326,122; Kwigillingok, $973,875; Saxman, $303,938; Eek, $210,000; Golovin, $74,700; Kobuk, $33,750; Kotlik, $375,000.

In June, President Obama signed an Executive Order establishing the first White House Rural Council, chaired by Agriculture Secretary Tom Vilsack. The White House Rural Council will work throughout government to create policies to promote economic prosperity and a high quality of life in our rural communities.

Since taking office, President Obama's Administration has taken significant steps to improve the lives of rural Americans and has provided broad support for rural communities. The Obama Administration has set goals of modernizing infrastructure by providing broadband access to 10 million Americans, expanding educational opportunities for students in rural areas, and providing affordable health care. In the long term, these unparalleled rural investments will help ensure that America's rural communities are repopulating, self-sustaining, and thriving economically.

USDA, through its Rural Development mission area, administers and manages housing, business and community infrastructure and facility programs through a national network of state and local offices. Rural Development has an existing portfolio of more than $150 billion in loans and loan guarantees. These programs are designed to improve the economic stability of rural communities, businesses, residents, farmers and ranchers and improve the quality of life in rural America.

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FISCAL NOTE

STATE OF ALASKA
2012 LEGISLATIVE SESSION

Bill Version: **SB 147**
Fiscal Note Number:
() Publish Date:

Identifier (file name): SB147-LEG-COU-02-06-12
Dept. Affected: Legislature
Title: "Relating to an Alaska Water & Sewer Task Force; and providing an effective date"
Appropriation: Legislative Council
Allocation: Council and Subcommittees
Sponsor: Senator Kookesh
Requester: Senate Community & Regional Affairs
OMB Component Number: 783

Expenditures/Revenues (Thousands of Dollars)

Note: Amounts do not include inflation unless otherwise noted below.

	FY13 Appropriation Requested	Included in Governor's FY13 Request	Out-Year Cost Estimates				
OPERATING EXPENDITURES	**FY13**	**FY13**	**FY14**	**FY15**	**FY16**	**FY17**	**FY18**
Personal Services	60.8						
Travel	46.6						
Services	0.5						
Commodities							
Capital Outlay							
Grants, Benefits							
Miscellaneous							
TOTAL OPERATING	**107.9**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

FUND SOURCE		(Thousands of Dollars)						
1002	Federal Receipts							
1003	GF Match							
1004	GF	107.9						
1005	GF/Prgm (DGF)							
1037	GF/MH (UGF)							
1178	temp code (UGF)							
TOTAL		**107.9**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

POSITIONS							
Full-time							
Part-time	**1**						
Temporary							

CHANGE IN REVENUES							

Estimated SUPPLEMENTAL (FY12) operating costs _____ *(separate supplemental appropriation required)*
(discuss reasons and fund source(s) in analysis section)

Estimated CAPITAL (FY13) costs _____ *(separate capital appropriation required)*
(discuss reasons and fund source(s) in analysis section)

Why this fiscal note differs from previous version (if initial version, please note as such)

Initial Version

Prepared by: Jessica Geary, Finance Manager — Phone: 465-6626
Division: Legislative Affairs Agency — Date/Time: 2/6/12 3:19pm
Approved by: Pamela Varni, Executive Director — Date: 2/6/2012
Legislative Affairs Agency

(Revised 1/17/2012 OMB)

FISCAL NOTE

STATE OF ALASKA **BILL NO.** SB 147
2012 LEGISLATIVE SESSION

Analysis

SB147 establishes the Alaska Water and Sewer Task Force in the Legislative Branch. The Task Force consists of nine members, comprised of four Legislators, one member of a State Agency, one member of a Federal Agency, and three public members, one of which will be an engineer. It is anticipated that the Task Force will hold five meetings, to be held in Allakaket, Venetie, Stebbins, Elin, and Anchorage. Travel funding for all nine members is included in this fiscal note. Meetings will be held in various locations, mainly local government facilities. There is a small facilities rental cost, which is included in this fiscal note. The Alaska Water and Sewer Task Force will be staffed by one Range 19 position for a period of seven months. The Task Force will develop and submit findings and proposed legislation addressing the provision of safe and sustainable water and sewer systems to all rural areas of the State. A report with the Task Force's findings and proposed legislation will be prepared by December 1, 2012 to be presented on the first day of the 2013 regular legislative session. Costs to teleconference meetings and print the proposals and reports will be absorbed in the existing Legislative Affairs Agency Budget.

FISCAL NOTE

STATE OF ALASKA cost ≠ codes
2012 LEGISLATIVE SESSION

Bill Version **SB 147**
Fiscal Note Number
Publish Date

Identifier (file name) SB147-DEC-FC-01-26-12
Title Water and Sewer Task Force
Sponsor Senator Kookesh
Requester Senate Community and Regional Affairs Committee

Dept. Affected Environmental Conservation
Appropriation Division of Water
Allocation Facility Construction
OMB Component Number 637

Expenditures/Revenues (Thousands of Dollars)

Note: Amounts do not include inflation unless otherwise noted below.

	FY13 Appropriation Requested	Included in Governor's FY13 Request	Out-Year Cost Estimates				
OPERATING EXPENDITURES	**FY13**	**FY13**	**FY14**	**FY15**	**FY16**	**FY17**	**FY18**
Personal Services	0.0		0.0	0.0	0.0	0.0	0.0
Travel	6.3		0.0	0.0	0.0	0.0	0.0
Services	0.0		0.0	0.0	0.0	0.0	0.0
Commodities	0.0		0.0	0.0	0.0	0.0	0.0
Capital Outlay	0.0		0.0	0.0	0.0	0.0	0.0
Grants, Benefits	0.0		0.0	0.0	0.0	0.0	0.0
Miscellaneous	0.0		0.0	0.0	0.0	0.0	0.0
TOTAL OPERATING	**6.3**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
FUND SOURCE			(Thousands of Dollars)				
1002 Federal Receipts	0.0		0.0	0.0	0.0	0.0	0.0
1003 GF Match	0.0		0.0	0.0	0.0	0.0	0.0
1004 GF	6.3		0.0	0.0	0.0	0.0	0.0
1005 GF/Prgm (DGF)	0.0		0.0	0.0	0.0	0.0	0.0
1037 GF/MH (UGF)	0.0		0.0	0.0	0.0	0.0	0.0
1178 temp code (UGF)	0.0		0.0	0.0	0.0	0.0	0.0
TOTAL	**6.3**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
POSITIONS							
Full-time	**0.0**		0	0	0	0	0
Part-time	0.0		0	0	0	0	0
Temporary	0.0		0	0	0	0	0
CHANGE IN REVENUES	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

Estimated SUPPLEMENTAL (FY12) operating costs 0.0 *(separate supplemental appropriation required)*
(discuss reasons and fund source(s) in analysis section)

Estimated CAPITAL (FY13) costs 0.0 *(separate capital appropriation required)*
(discuss reasons and fund source(s) in analysis section)

Why this fiscal note differs from previous version (if initial version, please note as such)

Not applicable, initial version.

Prepared by Michelle Bonnet, Director
Division Water
Approved by Lynn Kent
Deputy Commissioner

Phone 907-269-7599
Date/Time 1/26/12 9:12 AM
Date 2/17/2012

(Revised 8/17/2011 OMB)

FISCAL NOTE

STATE OF ALASKA **BILL NO.** SB 147
2012 LEGISLATIVE SESSION

Analysis

SB 147 would establish a Water and Sewer Task Force to address challenges in providing water and sewer improvements in rural Alaska villages. The Task Force would consist of nine members, including one state agency member. The bill currently calls for eight tasks, including significant research projects, to be completed during the first six months of FY2013.

Assumptions:
The bill, as written, does not specify how tasks would be completed or how extensive the effort should be. The Department assumes that it will be responsible for participating in the Task Force as the state agency member and will not be responsible for coordination, financial, or administrative support for the Task Force or it's activities. A number of the tasks called for in the bill are presently being completed through collaborative efforts between the Department of Environmental Conservation, the Alaska Native Tribal Health Consortium, and federal agencies. It is assumed that a much more comprehensive effort is envisioned by the author of the bill and that tasks would not be carried out by the Department, other than to provide existing data and information to the Task Force.

Travel:
Travel funding will be used for Department employees who participate in the Task Force meetings. The estimated cost per trip is $1,050 for six meetings.