Newtok Environmental Site Inventory and Assessment Project

Part III: Hazardous Substances Clean Up Plan

Prepared by:

Hobbit Environmental Consulting Corp.

Prepared for:

State of Alaska

Department of Commerce, Community and Economic Development

May 31, 2016

This Assessment is funded by a grant to the State of Alaska by the U.S. Department of the Interior, Fish and Wildlife Service, Coastal Impact Assistance Program, Federal Award F12AF00727, “Newtok Environmental Site Inventory and Assessment”.

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Acronyms

ACM	Asbestos Containing Material
ADEC	Alaska Department of Environmental Conservation
AKOSH	Alaska Occupational Safety and Health Administration
BIA	Bureau of Indian Affairs
DCCED	Department of Commerce, Community and Economic Development
ft	Feet
GAC	Granular Activated Carbon
HAZMAT	Hazardous Materials
Hobbit	Hobbit Environmental Consulting Corp.
mg/L	milligrams per Liter
NTC	Newtok Traditional Council
NVC	Newtok Village Council
PCB	Polychlorinated Biphenyl
PID	Photoionization Detector
RCRA	Resource Conservation and Recovery Act
TCLP	Toxicity Characteristic Leaching Procedure
UPC	Ungusraq Power Company
USACE	United States Army Corps of Engineers
USEPA	Environmental Protection Agency
YDNWR	Yukon Delta National Wildlife Refuge

Executive Summary

Hobbit Environmental Consulting Corp. (Hobbit) was contracted by the Alaska Department of Commerce, Community and Economic Development (DCCED) to undertake an Environmental Site Inventory and Assessment project for the village of Newtok, Alaska. Ms. Sally Cox is the DCCED project manager. Newtok is experiencing severe erosion and the village is in the process of being relocated. The purpose of this project was to inventory hazardous materials in the village, assess their impact on environmental conditions and provide a cleanup plan. Part III, developing a cleanup strategy is presented in this report.

The scope of work for Part III included:

1. Reviewing possible clean up options delineated in the Part II report and suggesting the most pragmatic approach;
2. Determining equipment and/or labor needs for cleaning up hazardous source material; and,
3. Providing a chronology for completing the work.

According to ADEC, no demolition waste from the Newtok deconstruction and move will be allowed into the existing Newtok landfill. Nonhazardous demolition material must be disposed separately from hazardous demolition material. Hazardous material may include: asbestos, lead paint, fluorescent lights and ballasts, mercury containing devices, household chemicals, drum contents and electrical transformers. Hazardous wastes cannot be disposed in the Newtok landfill and must be recycled, reused or disposed in a licensed facility.

An assessment program must be completed to determine the existence and extent of contaminated sites in Newtok. Hobbit suggests conducting an initial screening program to sample soils, surface water and the active water layer through the use of hand tools and equipment. Given the likelihood of near surface permafrost, the lack of heavy equipment in Newtok and high costs of equipment transport, the initial screening program outlined in this report would be a low cost, effective means of assessing contamination in soil and water.

After assessment activities have been completed and contaminated soil has been identified and delineated, remediation of soil may be required. The most likely soil contamination in Newtok would be hydrocarbons from fuel storage and dispensing areas. Given that the residents of Newtok will have moved to Mertarvik and infrastructure will have been removed, Hobbit suggests constructing a passive remediation system in the form of biopiles built within the existing tank farm berms. This suggestion assumes soils have not been impacted by metals.

The Newtok landfill is a Class III landfill. There is no requirement to assess soils or water within or surrounding a Class III landfill prior to closure. The landfill could be closed in place by constructing a cap in accordance with ADEC regulations. Remediated soil from the biopiles could be used in cap construction. The landfill cap must be inspected for a period of five years subsequent to closure. It should be noted that capping the landfill will not prevent waste material from entering the Ninglick River should erosion continue as far as the landfill. The landfill is located approximately 500 feet beyond the extent of erosion projected for the year 2027.

The sewage lagoon receives treated wastewater from the Newtok School. The lagoon will be in use as long as the school is operating. A formal closure of the lagoon is not practical given the likelihood of erosion destroying the lagoon soon after the Newtok move to Mertarvik has been completed.

A chronology suggesting the timing of cleanup activities is provided in Table 1 following the report text. Some elements of the cleanup plan must be completed in a sequential manner. In particular, sampling, laboratory analyses, and obtaining approvals or permits are prerequisites for subsequent elements of the cleanup plan. Some of these prerequisites, such as obtaining approvals or permits, require regulatory agency review and adequate time should be allotted so that permits are in place when needed.

1.0 Introduction

Hobbit Environmental Consulting Corp. (Hobbit) was contracted by the Alaska Department of Commerce, Community and Economic Development (DCCED) to undertake an Environmental Site Inventory and Assessment project for the village of Newtok, Alaska. Ms. Sally Cox is the DCCED project manager. The project consisted of three parts:

- Part I - prepare an inventory of hazardous materials;
- Part II - assess the hazardous materials in relation to environmental conditions; and,
- Part III - develop a cleanup strategy.

Part I was completed in October, 2015 and the inventory results were presented in the Part I report (Hobbit 2015). Part II, assessment of the hazardous materials in relation to environmental conditions was completed in November and December of 2015 and the results of the assessment were presented in the Part II report (Hobbit 2016). A table presenting a cleanup chronology and figures follow the report text.

1.1 Purpose of the Project

Newtok is a Yup'ik village located within the Yukon Delta National Wildlife Refuge (YDNWR). Severe erosion along the Ninglick River is threatening the village and plans are underway to relocate Newtok residents to the village of Mertarvik on Nelson Island. Continued erosion will likely destroy Newtok with buildings and infrastructure eventually eroding into the river and becoming waterborne hazards.

The proximity of the village to terrestrial and marine water bodies and its location within the wildlife refuge has prompted the need to inventory, assess and manage potential environmental impacts that could result from the erosion. The planned timetable for most of the remedial work will be after residents have moved to Mertarvik and Newtok infrastructure has been moved, demolished or decommissioned. Newtok is committed to restoring the village site to wetlands under the federal government's No Net Loss Policy for development of wetlands.

1.2 Scope of Work, Part III

The scope of work for Part III included:

4. Reviewing possible clean up options delineated in the Part II report and suggesting the most pragmatic approach;
5. Determining equipment and/or labor needs for cleaning up hazardous source material; and,
6. Providing a chronology for completing the work.

Hobbit performed the work under the DCCED term contract #15-013-128. No material, soil or water sampling has been conducted in association with this work. Part III is a continuation of the work completed in Parts I and II.

2.0 Hazardous Source Material

The locations of hazardous material sources in Newtok are provided in Figure 1. For the purposes of this report, the assessment of hazardous materials will be discussed according to the source material rather than according to their location. For example, hydrocarbon contaminated soils will be addressed as a unit, rather than addressing each tank farm individually. These categories were defined in the Assessment Report (Hobbit 2016) and repeated below. The inventory identified four sources of potentially hazardous materials in Newtok:

1. **Hazardous wastes.** Waste material such as asbestos containing material (ACM), lead paint, mercury containing devices, miscellaneous drums containing known and unknown liquids and polychlorinated biphenyls (PCB) containing transformers would fall under this designation.
2. **Hydrocarbon contaminated soil.** Hydrocarbon contaminated soil originates in tank farms and other fuel dispensing areas and is assumed to have no other contaminants than petroleum based constituents. Contaminated soil may be present at the four tank farms (Newtok School, vacant Bureau of Indian Affairs [BIA] School, Newtok Village Council [NVC] and Ungusraq Power Company [UPC]), the UPC Generator Building, and the locations of the Newtok Traditional Council (NTC) tanks and Tom's Store tanks.
3. **Solid waste materials in the landfill**. Although solid waste is not of itself a hazardous waste, the lack of control of dumping in the landfill has resulted in some material containing hazardous substances (fluorescent lights, e-waste, batteries, containers with solvents, automotive cleaners, paint thinners, etc.) to have been disposed in the landfill.

4. **Sewage Lagoon.** The sewage lagoon does not contain raw sewage wastes but does store treated wastewater discharge from the Newtok School and historic discharge from the washeteria.

It is important to note that no water, soil or material sampling or laboratory analysis was conducted as part of this project. Contaminated soil is actually *potentially* contaminated soil and is assumed to be present in fuel storage and handling areas but has not been definitively identified or delineated. For discussion purposes, contaminated soil volumes were estimated in Part I of this project based on the tank farm dimensions and where soil staining or stressed vegetation was observed. Materials identified as hazardous wastes have not been tested and were identified as hazardous waste solely by observation, common knowledge of occurance or from labels (sometimes hand written) on drums and containers.

3.0 Hazardous Wastes

Hazardous wastes are regulated through the Resource Conservation and Recovery Act (RCRA). Working with ACM falls under the Alaska Occupational Safety and Health Administration (AKOSH) regulations. Hazardous wastes cannot be disposed in the landfill. They must be recycled, reused or shipped out and disposed in a licensed hazardous waste disposal facility. There are no hazardous waste disposal facilities in Alaska. There is an allowance, however for small quantity generators to dispose of hazardous waste at a Municipal Class I or II landfill in the state. A small quantity generator is defined as one that generates less than 220 pounds per month per site. The Alaska Department of Environmental Conservation (ADEC), Solid Waste Department can help in determining if Newtok would fall into this category and with finding a landfill that might accept the waste.

3.1 Building Demolition

According to ADEC, no demolition waste from the Newtok deconstruction and move will be allowed into the existing Newtok landfill (personal communication, 2016). Disposal plans for the construction and demolition debris should be made prior to beginning the work. Although most construction and demolition waste material is not hazardous, all of the debris must be removed from Newtok, and either reused in Mertarvik, burned or disposed in a licensed facility. This facility can be an existing, permitted landfill, or it may be possible to obtain a permit from ADEC for a project-specific landfill. Only “clean wood” defined as dimensional lumber that has not been treated with a paint or preservative can be burned (ADEC 2015). The ash must be disposed in a landfill. **Treated wood and ACM may not be burned**.

Hazardous wastes must be handled separately from the general construction and demolition waste. Potential hazardous wastes associated with building demolition are:

- **ACM and Lead Paint**. Neither ACM nor lead paint can be identified by sight; their identification can only be confirmed by sampling the material and submitting the sample to a laboratory for analysis. If ACM or lead based paint is associated with the demolition material it must be disposed separately from the other general demolition debris. Handling and disposal of ACM and/or lead paint waste should be organized by the demolition contractor prior to commencing with demolition work. **A certified asbestos abatement professional must supervise all demolition work associated with ACM.** Information regarding asbestos abatement certification is provided below in Section 3.2.3, Asbestos Disposal.
- **Fluorescent Lights.** Fluorescent lights can contain mercury and should be removed and stored for recycling.
- **Fluorescent Light Ballasts**. Check the ballasts for the statement "no PCBs". PCBs were banned in 1979 and ballasts not having PCBs are required to have a statement saying so. If there is no statement, assume the ballast has PCBs and treat it as a hazardous waste.
- **Mercury Containing Devices**. Remove mercury thermometers and switches from appliances and furnaces not being reused in Mertarvik.
- **Freon.** Remove freon from refrigerators not being reused in Mertarvik.
- **Household chemicals (paints, thinners, cleaning products, etc.)** Transport all household chemicals to Mertarvik.
- **Electronics.** Electronics can contain heavy metals and cannot be disposed in the landfill. Electronics not being used in Mertarvik should be stored for recycling.
- **Creosote treated wood.** Treated wood is not a hazardous waste and can be disposed in a landfill with other construction debris. It is noted here because **this wood must not be burned** as toxic contaminants could be released during burning. The old BIA School building is sitting on pilings that appear to be treated with creosote. Treated wood was also observed under fuel storage tanks in the Newtok School tank farm, the NVC tank farm and the old BIA School tank farm.

3.1.1 Asbestos Sampling

ACM has been found in the gaskets of the boiler, furnace, insulating pad in the cookstove and some floor tiles of the old BIA School building. Public buildings and residences built before 1990 should be sampled for asbestos if they have floor or ceiling tiles, as well as any other building that may be suspect. Asbestos cannot be identified

by sight. Identification requires collecting samples of the building material and having the samples analyzed by a laboratory. Caution must be taken when sampling for asbestos so as not to inhale the airborne fibers that could be released when breaking off a sample. **It would be highly advisable to have a certified asbestos abatement specialist conduct an asbestos sampling program in Newtok to determine the existence and volume of asbestos in residences and public buildings well before moving or demolishing structures.** This information will also be required to prepare disposal plans for asbestos material as disposal options are volume dependent.

3.1.2 Lead Sampling

The use of lead based paint was banned in 1978. Sampling of paint for lead in all houses built prior to 1978 should be conducted before demolition. In particular, the BIA houses should be sampled. Although lead based paint was banned in 1978, the paint may have been used after the ban. If there is any suspicion that lead based paint was used in a home built after 1978 it should be sampled. White Environmental Consultants in Anchorage is the only accredited lead testing lab in Alaska on the United States Environmental Protection Agency (USEPA) accreditation list. They can provide sampling guidance. No special training or certification is required when collecting paint samples. It is important that the sampler(s) are accurate in labeling sample locations. The sample needs to be approximately 100 grams (the size of a credit card) and can be placed in a clean Ziploc bag or other clean closed container. Wear disposable vinyl gloves when collecting the sample, and use a new set of gloves for each sample. A link to White Environmental Consultants is provided in the Reference Section.

3.2 Hazardous Waste Reduction, Recycling and Disposal

Some hazardous wastes were stored in the Hazardous Material Shed behind the NTC building (#5 on Figure 1) and in drums in the Newtok School tank farm (#7 on Figure 1). Household hazardous waste may include: unused paints, paint thinners, household cleaners such as bleaches and ammonia, automotive products such as used oil, used antifreeze, batteries, and used electronics such as TVs, computers, cell phones. None of these materials can be disposed in the Newtok landfill and none should be left behind after moving to Mertarvik. Many of these materials can be reused or recycled to reduce the amount of material being shipped out of Newtok.

3.2.1 Hazardous Waste Reduction

Some options for reducing hazardous waste in Newtok include:

- **Burning used oil.** The Newtok School has an oil burner in its storage shed. Used oil was stored in drums in the Newtok School tank farm, at the UPC generator

building and possibly in other areas in the village. Continued burning of used oil would significantly reduce the volume of hazardous waste requiring disposal.

- **Recycling antifreeze.** Used antifreeze was stored in drums in the Newtok School tank farm. Antifreeze can be recycled and reused if Newtok has access to a portable antifreeze recycling unit.
- **Sharing household chemicals.** A household waste exchange could be created in Mertarvik where leftover paints, thinners, cleaners, etc. could be dropped off at a designated building and made available to residents who could use them.

3.2.2 Hazardous Waste Recycling

A number of items can be sent out for recycling.

- Vehicle batteries, fluorescent lights, fluorescent light ballasts, mercury containing devices, appliances and e-waste can be sent to Total Reclaim in Anchorage (see link in Reference section).
- Appliances and scrap metal could be sold to a scrap metal dealer. Appliances must have hazardous substances (freon, mercury containing devices, asbestos) removed prior to shipping. Newtok will likely have a large volume of scrap metal from tanks, drums, ATVs, snowmachines, etc. once the move to Mertarvik is completed. Although appliances and scrap metal are not hazardous wastes, they are included in this category as transporting and selling them to a scrap metal dealer would lessen the amount of material disposed in a landfill.

3.2.3 Hazardous Waste Disposal

ASBESTOS

AKOSH and USEPA must be notified 10 days prior to asbestos removal. Notification phone numbers are provided in the Reference Section. Removal of ACM material must be conducted by certified asbestos abatement professionals using proper safety equipment to prevent fibers from becoming airborne. All personnel working within the regulated area (the secured area containing ACM) are required to be certified. ACM material must be sealed and stored in impermeable containers or bags and properly labeled for shipping and disposal. A waste shipment record will accompany the load.

Newtok residents could become certified asbestos abatement professionals by completing an accredited 40 hour course and applying to AKOSH for certification. Accredited courses are offered by EMI and Satori Group in Anchorage. Under OSHA regulations a “competent person” must direct the asbestos abatement activities. This person should have experience in the field, in addition to having completed the course, in order to properly address problems that can arise during the abatement activities. These activities require the use of proper safety equipment as well as abatement

equipment. The economics of buying the equipment and safety gear, and certifying Newtok residents to perform the work, together with the safety issues surrounding airborne asbestos, may be prohibitive. It would be advisable to contact an asbestos abatement company to compare the economic feasibility of contracting the company to perform the work versus certifying Newtok residents and renting or buying the equipment to properly perform the work safely. Safety considerations should take high priority in making the decision.

There are landfills in Alaska permitted to accept ACM, however often they only accept material from inside their operating area. The Anchorage Regional Landfill might accept outside material on a case by case basis. Alternatively, depending on the volume of ACM it may be possible to apply to ADEC for either a one-time disposal of asbestos containing waste permit or an asbestos waste monofill permit. ADEC Solid Waste personnel can help with determining the best means of disposing of the ACM. **Disposal options are volume dependent, so it is important to have completed an ACM sampling program early in the process to determine the type and volume of asbestos material in Newtok.**

LEAD BASED PAINT

According to the ADEC Lead-Based Paint Waste Disposal Guide (ADEC 2011a) wastes with a Toxicity Characteristic Leaching Procedure (TCLP) for lead less than 5 milligrams per liter (mg/L) may be disposed at a Class I or II Municipal Landfill. If the lead value exceeds 5 mg/L and the volume of waste is below 200 pounds per month, the wastes may be disposed at a Class I or II Municipal Landfill. Volumes greater than 200 pounds per month must be disposed at a licensed hazardous waste facility.

DRUM MATERIAL

Some of the drums in the Newtok School tank farm were not labeled. The contents of these drums, as well as any material that cannot be reduced, recycled or reused, and will need to be transported for disposal must be sampled and analyzed. Sampling these liquids must be done by people having hazardous material (HAZMAT) training and should be conducted under the guidance of a qualified environmental professional.

ELECTRICAL TRANSFORMERS

Electrical transformers manufactured prior to 1978 may contain PCBs. Hobbit could not inspect the transformers in Newtok because they were not readily accessible to read their markings. According to USEPA regulation, transformers containing PCBs should be marked as such. It may state directly “PCBs” or it may list one of its trade names: Abestol, Aroclor, Askarel, Clophen, Chlorextol, DK, EEC-18, Fenclor, Inerteen,

Kennechlor, No-Flamol, Phenoclor, Pyralene, Pyranol, Saf-T-Kuhl, Solvol, non-flammable liquid (USEPA 2016). PCB containing transformers must be transported and disposed at a licensed hazardous waste facility.

3.3 Timing

Asbestos and lead sampling and analysis must be completed prior to moving or demolishing structures suspected of having asbestos or lead paint. Although houses will be moved/demolished in phases, it would be useful for disposal planning purposes to sample all suspected asbestos and lead containing materials within the village before the initial phase.

Disposal planning must be completed prior to demolishing structures suspected of having asbestos or lead paint. If transporting materials to another landfill, prior approval from the landfill is required. If a one-time disposal or monofill is considered, application must have been made and approval received from ADEC prior to demolition.

The USEPA and AKOSH must be notified 10 days prior to asbestos removal. Telephone numbers are provided in the Reference Section.

Reducing and recycling hazardous wastes can take place at any time. Ideally, transport of materials to Mertarvik should take place whenever there is room on barges travelling back and forth between Newtok and Mertarvik during the course of the move. As materials and equipment are being barged in from other locations to construct Mertarvik, it may be possible to take advantage of available backhaul space to barge out recyclables or other wastes needing disposal.

4.0 ASSESSMENT PROGRAM

Since no water, soil or material sampling or analysis was conducted as part of this project, the first element in the cleanup plan would be the assessment work. The purpose of the assessment would be to identify the types, concentrations and spatial extent of contamination in soils and water. Data from the assessment work would be used to determine the cleanup criteria considered nonhazardous to human health or the environment. No cleanup plan can be finalized until the assessment work has been completed and cleanup criteria are established.

It should be noted that some assessment and remediation techniques will require equipment or disposal involving transportation by barge. Due to erosion damage there is no barge landing currently in Newtok. Construction of a barge landing will be necessary for the village move. Assessment and remediation activities will likely have to be undertaken after the barge landing is constructed.

4.1 Field Sampling of Soil and Surface Water

The Hobbit Assessment Report (Hobbit 2016) proposed a screening program for soils and surface water. The suggested program is reproduced below in Section 4.1.1. The purpose of the screening program would be to provide an initial understanding of contaminant concentrations in Newtok. Site assessments are usually conducted using a drilling rig or backhoe to be able to sample deeper soils and to install monitoring wells (drilling rig) if groundwater is a concern. Hobbit is proposing a screening program based on manually augering into the soil. The assumed shallow depth of permafrost precludes the need for mechanical sampling equipment. Since site equipment in Newtok is limited and the cost of transporting equipment is high, a screening program could be conducted in a relatively inexpensive manner as it does not require heavy equipment and would provide preliminary information about the site. A workplan outlining the initial screening objectives and methodologies would be submitted to ADEC for approval prior to initiating the field work.

4.1.1 Initial Hydrocarbon Contaminant Screening Program

The initial screening program would be conducted by manually hand augering into surface soils at suspected contaminated source locations (fuel storage areas and the power generation building). A hand auger or two man power auger could be used to dig into the soils. Since permafrost is suspected to be encountered near surface (approximately 1 foot depth) and the confining character of permafrost can act as a barrier to vertical migration, only shallow soils would be sampled. All field and laboratory samples would be collected as per ADEC protocols. Samples would be collected on a grid pattern. Headspace vapors would be screened in the field using a photoionization detector (PID). Headspace vapor measurements can provide an initial indication of hydrocarbons in soil and aid in determining which samples to submit for laboratory analysis. Vapor probes could also be advanced into suspect soils for initial screening of hydrocarbon vapors.

Select soil samples would be submitted for laboratory analysis. Chemistry results provide a more accurate characterization of chemicals in the soil than the field screening techniques. Samples would be analyzed for hydrocarbons although some soil samples would also be analyzed for metals due to the possibility of historic storage of leaded gasoline.

Permafrost is believed to be approximately 1 ft below ground surface and provides a barrier to groundwater. The active water layer (permafrost meltwater) could be sampled through probes or manually installed wells. Sampling should be conducted in late summer when the active water layer would most likely be present. Surface water samples could be collected from standing water in the proximity of the fuel storage

areas, UPC generator building, and from any standing water exhibiting hydrocarbon sheen. Samples would be collected using ADEC surface water sampling protocols and analyzed for hydrocarbons, metals and water quality parameters.

4.1.2 Initial Screening Program Results

The results of the initial screening program will provide quantitative data regarding the type and extent of contamination in Newtok, will determine if more assessment work is necessary and could be used to apply for funding for further assessment and cleanup work. If the initial screening results do not define the areal or vertical extent of contamination further assessment may be required. This assessment would likely require the use of heavy equipment such as a backhoe for soil assessment or a drill rig for deeper soil sampling and installing monitoring wells for groundwater sampling.

4.2 Determination of Cleanup Criteria

Given that Newtok would no longer have any residents or infrastructure and the primary land use would be subsistence, risk assessment would be the most probable method for determining clean up levels in Newtok. A risk assessment is a formal evaluation of hazards to human health and environment at a specific location by specific contaminants. The evaluation would include examining: concentrations and toxicity of the contaminants; spatial extent of the contamination; fate and transport of contaminant migration; exposure pathways to human and ecological receptors; and, estimating the potential harm to humans and the environment from exposure to the contaminant.

4.3 ADEC Documentation

ADEC is responsible for reviewing and approving all steps of the assessment and remediation phases of the contaminated site work. Documentation submittal requirements from Newtok's environmental representative to ADEC would include:

1. **Initial Screening Workplan**. Approval of the workplan is needed before commencing field work. The workplan includes information regarding: purpose of field work, a preliminary conceptual site model (as completed in Section 3.2.1 of the Assessment Report [Hobbit 2016]); a description of contaminants of potential concern; proposed sample locations; methodology for collecting soil and surface water samples; field screening methods; laboratory analysis that should be requested and quality control methods. Based on the ecoscoping exercise conducted in Section 3.2.2 of the Assessment Report (Hobbit 2016) an Ecological Conceptual Site Model should be developed as part of site assessment activities.
2. **Site Characterization and possible Risk Assessment Reports.** The Site Characterization Report presents: a summary of the results of the soil and water

assessment, an analysis of the field and laboratory data, and conclusions regarding the need for further assessment work or proposed remediation techniques and cleanup levels. Risk assessment would be included with the site characterization report if used to determine cleanup levels.

4.4 Equipment and Timing

No heavy equipment would be required for the initial screening as described above. Hand tools and equipment can be used for screening and sampling near surface soils, surface water and the active water layer (permafrost meltwater).

All assessment work must be conducted by a "qualified environmental professional" as defined by Alaskan Statute 18 AAC 75.333 (ADEC 2016).

The initial sampling program should be conducted in late summer (late August, early September) when the active water layer would most likely be present. Although the cleanup program is scheduled to be conducted after the move to Mertarvik has been completed, some areas of Newtok are under more immediate risk of erosion than others. In particular, the Newtok School area (Site #1 on Figure 1) could be eroded as early as 2022 according to the United States Army Corp of Engineers (USACE) erosion projections (USACE 2009). Figure 2 (Newtok Planning Group Website 2016) presents the erosion projections. The school has potentially contaminated soils in the above ground storage tank farm and stressed vegetation near the tank located next to the electrical generator conex. This area will likely erode prior to the move to Mertarvik being completed and if so, sampling should occur in time to move contaminated soil if present. It would make economic sense to sample other potential contaminant sources (fuel storage areas and power generator building) at the same time.

5.0 Contaminated Soil Cleanup

After assessment activities have been completed and contaminated soil has been identified and delineated, remediation of the soil may be required. This determination will be based on a comparison of contaminant concentrations to cleanup criteria. The most likely soil contamination in Newtok would be hydrocarbons. Given that the residents of Newtok will have moved to Mertarvik and infrastructure will have been removed, Hobbit suggests that a passive remediation system in the form of biopiles could be a pragmatic means of remediating hydrocarbon contaminated soil while protecting the surroundings from contaminant migration. This suggestion assumes soils have not been impacted by metals.

Water sampling would determine if contaminants have impacted the surface or active water layer. Since contaminant sources in Newtok will have been decommissioned and undergoing remediation, water monitoring rather than remediation would likely be sufficient.

5.1 Suggested Remediation Plan

Hydrocarbons are organic chemicals that under the right conditions will naturally decompose over time. Oxygen, heat or sunlight and bacteria in the soil contribute to the decomposition of hydrocarbons. Assuming hydrocarbons are the only contaminants of concern at the fuel storage areas and the UPC generator building, the goals for cleanup of hydrocarbon contaminated soils would be:

1. Remove the source of hydrocarbon contamination.
2. Prevent migration of contaminants to the surrounding environment.
3. Allow the contaminants to biodegrade over time taking into consideration minimal human contact with contaminated soils and the concern for erosion.
4. Consider the lack of equipment on site, high transportation costs, and absence of supporting infrastructure (such as electricity).

Hobbit suggests a modified leave in place cleanup plan whereby biopiles of hydrocarbon contaminated soil would be constructed within the existing tank farm berms after above ground storage tanks and associated piping have been decommissioned and removed. Piping within the biopiles would provide a passive oxygen source into the soil. A soil and water sampling program would be in place during the period of remediation to monitor the rate of degradation and ensure contaminants are not migrating. This cleanup plan would satisfy the above mentioned goals because:

1. The hydrocarbon sources (fuel storage) will have been removed.
2. The existing berm structure would prevent the migration of contaminants to the surrounding environment. Some of the berms would need repair and reinforcement to maintain their integrity. Surface water, and if necessary, groundwater sampling in the vicinity of the biopiles during the remediation process would monitor contaminant migration.
3. Although biodegradation would be a slow process, it might not be detrimental to the situation. With the exception of the Newtok School tank farm and possibly the UPC generator building, most of the fuel tank storage areas are located far from immediate areas of erosion, i.e. likely 10 to 20 years beyond the erosion projection for the year 2027 (Figure 2). No formal erosion projections have been made beyond 2027. Contaminated soil from the Newtok School and possibly the UPC generator would have to be moved away from immediate erosion. ADEC

approval would be required. Human contact with contaminants would be minimal and limited to the biopile construction period and periodic soil sampling. Newtok is in an isolated area. Residents would no longer be living in the area and human travel through the area would be occasional and short term.

4. Soils would be remediated in place and therefore equipment and transport requirements are minimal. The tank farm berms already exist. A passive system would require no accompanying infrastructure.

5.2 Biopile Construction

An example of a passive biopile design is presented in Figure 3. Hydrocarbon contaminated soils would be excavated and stockpiled outside of the tank farm berm. Confirmatory soil samples would be collected from the excavation walls and base and analyzed to ensure no contamination is left in place. Stockpiled soils would then be placed on a liner within the bermed area. Slotted PVC piping would be placed on the soil extending out of the pile to allow the passive movement of air through the soil. Geotextile cloth should cover the piping to prevent clogging. The biopile should be covered with a liner to reduce water accumulation within the bermed area. The liner would also conserve heat within the biopile system thus augmenting the degradation process.

Soil samples from the biopile would be collected and analyzed for hydrocarbon constituents to provide a baseline for monitoring contaminant degradation. Subsequent sampling events would occur on a regular basis as defined by the formal cleanup plan approved by ADEC. Monitoring events would likely occur once or twice during the spring/summer/fall (non frozen soil) months. If water accumulates within the bermed area to the extent that it needs removal, it must be sampled to determine if it meets pump off criteria. Contaminant concentrations in the water exceeding pump off criteria could be treated with granular activated carbon (GAC).

5.3 ADEC Documentation Requirements

The following documents at a minimum would be submitted to ADEC for approval. Additional reporting may be required by ADEC.

1. **Formal Cleanup Plan.** A detailed design and construction plan for the remediation would be submitted to ADEC. This design would be based on assessment results. Approval by ADEC of the cleanup plan would be required prior to cleanup activities taking place. The cleanup plan would include: technical and design details for the remediation method, containment and monitoring plans to protect surrounding areas from contaminant migration, site sampling and confirmatory sampling methodologies, and interim reporting requirements.

2. **Interim Monitoring Reports.** Monitoring reports summarizing the results of any soil or water sampling undertaken during the remediation period may be required by ADEC. These reports are often annual reports although soil or water sampling may be required on a more frequent basis (quarterly or semi-annually).
3. **Final Report.** When the site has been successfully remediated a final report will be issued to ADEC presenting: a summary of site activities, a discussion of any contamination left in place, and confirmatory sampling results.

5.4 Equipment and Timing

Excavation equipment in the form of a backhoe or excavator would be required to dig out contaminated soils and construct the biocells. The size of the equipment would influence the time required to do the work. Ideally, equipment used during village deconstruction could be used to do the remediation work. Soil from the Newtok School and possibly the UPC Generator areas would have to be transported away from eroding areas.

In addition to the equipment operator, a qualified environmental professional should be on site to direct the excavating and construction activities and conduct the soil and water sampling. Local labor may be needed to aid in excavation and construction activities and in repairing or reinforcing the berms.

With the possible exception of the Newtok School and UPC Generator areas which may need to be excavated earlier due to erosion, excavation of contaminated soil and construction of biopiles would be conducted after the village move has been completed. If equipment on site for the village move is to be used then assessment activities and ADEC approvals must be completed prior to finishing the village move.

6.0 Landfill

The Newtok landfill is classified as a Class III landfill. There is no requirement to assess soils or water within or surrounding a Class III landfill prior to closure. Landfill closure is overseen by ADEC Solid Waste Program personnel. According to ADEC, the landfill could be closed in place by constructing a cap in accordance with the requirements of 18 AAC 60 (ADEC 2013). The landfill would be closed after the move to Mertarvik has been completed. Before capping the landfill it may be worthwhile to reduce the amount of material in the landfill to decrease the volume of the material requiring capping.

6.1 Reducing Landfill Wastes

Some reduction activities could include:

- Segregating out the large metal materials such as: snowmachines, appliances, empty drums, empty steel tanks, etc. The large, metal material already in the landfill could be consolidated with the scrap metal from the village and sold to a scrap metal dealer.
- Having residents bag or dispose of combustible material separately (paper, cardboard, wood furniture, etc.). The combustible material could be burned in the burn unit that is currently at the landfill.
- Recycling the e-waste that had been segregated to one side of the landfill if possible. Total Reclaim would need to see pictures of the fire damaged items to determine if recycling would be possible (link to Total Reclaim is in the Reference Section). No new e-waste should be disposed in the landfill but should be stored in the hazardous waste shed or in another location until it can be shipped out for recycling.

6.2 Capping the Landfill

A typical landfill cap consists of 18 inches of compacted soil (ideally clay), followed by 6 inches of topsoil and graded to allow for drainage (ADEC 2013). The topsoil must be seeded with native vegetation. Newtok likely does not have soil available for constructing the 18 inches of cover and alternative material may be needed. One possibility would be to use a geomembrane liner to cover the landfill. Topsoil and/or the remediated soil from the tank farms could be placed on the liner and seeded with vegetation. Written notification to ADEC Solid Waste of landfill closure must be submitted within 90 days of constructing the landfill cap.

Prior to building the cap, waste should be compacted either by running over it with heavy equipment or using equipment such as a baling machine or compactor to consolidate the waste into a more stabilized state. The baler or compactor could be used subsequently at the landfill in Mertarvik.

The closed landfill must be visually inspected at least once a year for five years. Any erosion or cracks, holes, etc. would be repaired and vegetation should be reseeded if vegetative growth is not adequate. At the conclusion of the five year inspection period, a closure report with photographs of the site and a description of any repair work completed must be submitted to ADEC Solid Waste department.

It should be noted that capping the landfill will not prevent waste material from entering the Ninglick River should erosion continue as far as the landfill. The landfill is approximately 500 feet beyond the extent of erosion projected by USACE for the year 2027 (Figure 2). No formal erosion projections have been made beyond 2027.

6.3 Timing and Equipment

Reduction of landfill materials could occur at any time. Labor will be required to remove scrap metal, appliances and e-waste from the landfill if reduction of materials is desired. Proper safety protection should be worn by laborers and the work should be supervised by someone who has completed HAZMAT training.

Closure of the landfill should occur after the move to Mertarvik has been completed and no more materials would be entering the landfill.

Heavy equipment in the form of an excavator would be required to construct the cap. At a minimum, topsoil would have to be hauled from its source to the landfill. It may be possible to use soil from the contaminated soil biopiles as landfill cover material once the remediation process has been completed.

7.0 Sewage Lagoon

The lagoon receives treated wastewater from the Newtok School. The school has a wastewater discharge permit authorizing it to discharge the wastewater to surface water after treatment. Sewage lagoon closure will involve ADEC Solid Waste Program personnel. The sewage lagoon is located between the Newtok School and the Newtok River and according to the erosion projection may start eroding into the Ninglick River between 2022 and 2027. A typical sewage lagoon closure would leave sludge material in place and build a soil cap covering the sludges with at least two feet of soil, drainage control and vegetation (ADEC 2011b). The lagoon closure would be monitored for a period of five years after capping has been completed.

The lagoon will be in use as long as the school is operating. A formal closure of the lagoon is not practical given the likelihood of erosion destroying the lagoon soon after the Newtok move to Mertarvik has been completed. Should erosional conditions change, a closure plan could be initiated at a later time.

8.0 Timing

A chronology suggesting the timing of cleanup activities is provided in Table 1 following the report text. Although many waste reduction and recycling activities can be carried out at any time, some elements of the cleanup plan must be completed in a sequential manner. In particular, sampling, laboratory analyses, and obtaining approvals or permits are prerequisites for subsequent elements of the cleanup plan. Some of these prerequisites, such as obtaining approvals or permits, require regulatory agency review and adequate time should be allotted so that permits are in place when needed.

9.0 References

Alaska Department of Environmental Conservation (2011a). *Lead-Based Paint Waste Disposal.* August 2011.

Alaska Department of Environmental Conservation. (2011b). *Sewage Lagoon Closure Guidance.* August 2011.

Alaska Department of Environmental Conservation. (2013). *18 AAC60 Solid Waste Management Regulation*. As amended through April 12, 2013.

Alaska Department of Environmental Conservation. (2014). *Asbestos Handling and Disposal.* July 2014.

Alaska Department of Environmental Consevation. (2015). *Handling and Disposal of Construction and Demolition Waste.* September 2015.

Alaska Department of Environmental Conservation. (2016). *18 AAC 75, Oil and Other Hazardous Substances Pollution Control.* May 8, 2016.

Alaska Department of Environmental Conservation. *Personal Conversation with Stephen Price, Rural Landfill Specialist, Solid Waste Management.* May 18, 2016.

Hobbit Environmental Consulting Corp. (2015). *Newtok Environmental Site Inventory and Assessment Project. Part I: Hazardous Materials Inventory.* Prepared for State of Alaska, Department of Commerce, Community and Economic Development. October 29, 2015.

Hobbit Environmental Consulting Corp. (2016). Newtok Environmental Site Inventory and Assessment Project. Part II: Assessment. Prepared for State of Alaska, Department of Commerce, Community and Economic development. January 4, 2016.

Newtok Planning Group. (2016). *Newtok Shoreline Erosion Map.* Retrieved from: https://www.commerce.alaska.gov/web/dcra/PlanningLandManagement/NewtokPlanningGroup.aspx

United States Army Corp of Engineers. (2009). *Alaska Baseline Erosion Assessment, Study Findings and Technical Report.* March 2009.

United States Environmental Protection Agency. (2016). *PCBs Questions and Answers*. Retrieved from: https://www3.epa.gov/region9/pcbs/faq.html

LINKS

Total Reclaim: http://www.totalreclaim.com/about-us/contact/

White Environmental Consultants: http://www.wecenv.com/

ASBESTOS REMOVAL NOTIFICATION PHONE NUMBERS

USEPA (907) 271-3688

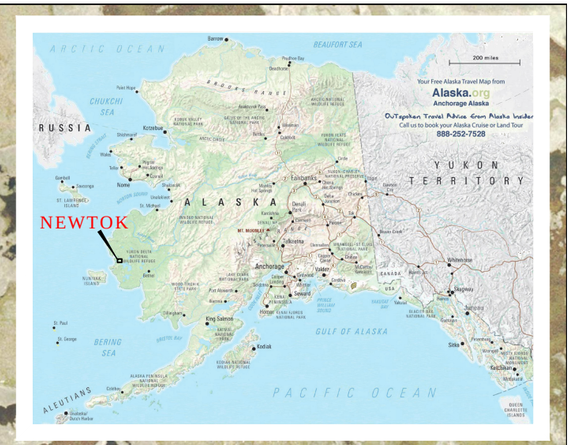
AKOSH (907) 269-4955

10.0 Limitation of Liability

This report has been prepared and the work referred to in this report has been undertaken by Hobbit Environmental Consulting Corporation hereinafter referred to as Hobbit for the Alaska Department of Commerce, Community and Economic Development. The work was performed in accordance with generally accepted environmental consulting practices. The work undertaken by Hobbit with respect to this report and any conclusions or recommendations made in this report reflect Hobbit's judgment based on the site conditions observed at the time of the site inspection on the date(s) set out in this report and on information available at the time of preparation of this report. This report has been prepared for specific application to this site and it is based solely upon visual observation of the site and readily available information, all as described in this report. No material, soil or water sampling was conducted. No formal quotes or estimates have been obtained. Unless otherwise stated, the findings cannot be extended to previous or future site conditions, or portions of the site which were unavailable for viewing directly. No warranty, express or implied, is made.

Table 1
Suggested Chronology of Cleanup Activities

Time Period	Report Section	Activity
At Least One Year Preceeding the Commencement of Demolition Activities	3.1.1 Asbestos Sampling	Conduct asbestos/lead sampling program.
	3.2.3 Hazardous Waste Disposal	Arrange for asbestos and lead disposal approvals and/or permits.
	3.1 Building Demolition	Arrange for demolition debris disposal approvals and/or permits.
	3.1 Building Demolition	Arrange for certified asbestos abatement specialist(s) to be on-site during demolition activities.
	3.2.3 Hazardous Waste Disposal	Notify USEPA and AKOSH 10 days prior to demolishing a building containing ACM.
At Least One Year Preceding Erosion Reaching Newtok School	4.1 Field Sampling of Soil and Surface Water	Prepare and submit soil screening workplan to ADEC.
	4.1.1 Initial Hydrocarbon Contaminant Screening Program	Conduct soil sampling program.
	4.4 Equipment and Timing	Obtain ADEC approval and excavate and move school contaminated soil if necessary.
During the Move	4.3 ADEC Documentation	Prepare and submit soil characterization report to ADEC.
	3.2 Hazardous Waste Reduction, Recycling and Disposal	Reduce and recycle hazardous waste as much as possible.
	6.1 Reducing Landfill Wastes	Reduce landfill wastes to decrease landfill footprint.
	3.3 Timing	If transporting hazardous waste to Mertarvik take advantage of free space on barges travelling back and forth between Newtok and Mertarvik.
	3.3 Timing	If transporting hazardous waste or recycling material away for disposal take advantage of potential available backhaul space on barges bringing construction material and equipment into Mertarvik.
	6.0 Landfill	Dispose of all nonconstruction wastes in the landfill from staging areas in Newtok after materials have been segregated for reuse or recycling. No wastes should be left in the village after the move has been completed.
After the Move has been Completed	4.1.2 Initial Screening Program Results	Conduct additional soil assessment if necessary.
	5.3 ADEC Documentation Requirements	Prepare and submit soil remediation plan to ADEC.
	5.1 Suggested Remediation Plan and 5.2 Biopile Design	Conduct soil remediation.
	6.0 Landfill	Work with ADEC to design landfill closure plan.
	6.2 Capping the Landfill	Close landfill by capping.
	6.2 Capping the Landfill	Prepare and submit written notification of landfill closure to ADEC within 90 days of constructing the landfill cap.
	5.2 Biopile Design	Conduct soil and water monitoring for duration of soil remediation, if necessary, and prepare and submit monitoring reports to ADEC.
	6.2 Capping the Landfill	Conduct yearly inspections of landfill cap for 5 years and make any repairs necessary.
	5.3 ADEC Documentation Requirements	Prepare and submit final remediation report to ADEC when soils have reached cleanup criteria.
	6.2 Capping the Landfill	Prepare and submit final landfill report to ADEC when inspection period is over.



AIR STRIP

NEWTOK RIVER

LEGEND:

1	NEWTOK SCHOOL
2	NEWTOK CLINIC
3	WASHETERIA
4	UPC GENERATOR
5	NTC BUILDING
6	SEWAGE LAGOON
7	APPLIANCE / SNOW MACHINE STAGING AREA
8	BAGGED WASTE STAGING AREA
9	OLD BIA SCHOOL
10	TOM'S STORE
11	ARMORY
12	NVC TANK FARM
13	NTC TANK
14	UPC TANK FARM
15	LANDFILL

2005 COMMUNITY MAP NEWTOK,
ALASKA DEPARTMENT OF COMMERCE,
COMMUNITY AND ECONOMIC DEVELOPMENT

0 200 400ft.
SCALE IN FEET

HOBBIT ENVIRONMENTAL

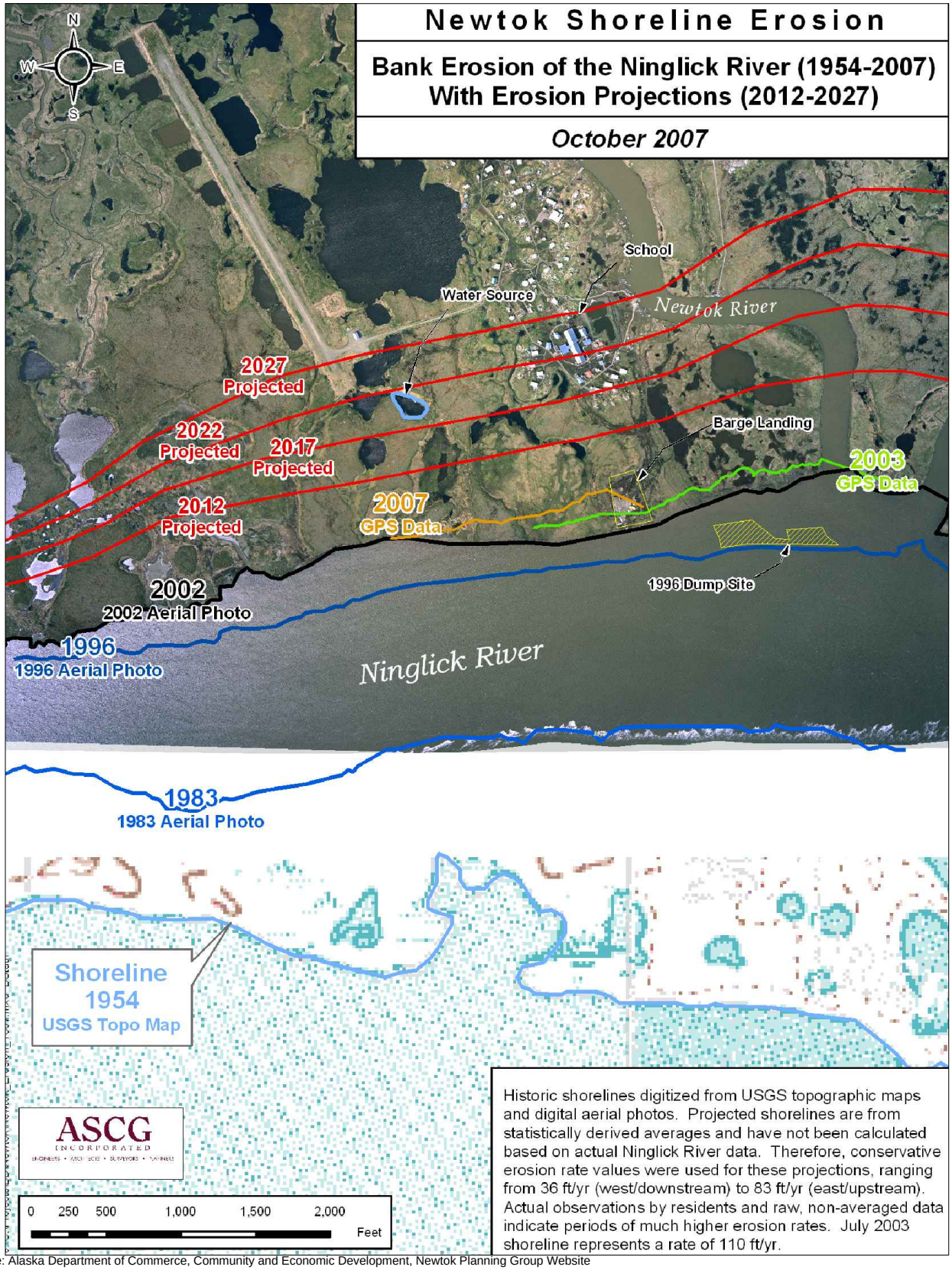
VILLAGE PLAN
NEWTOK, ALASKA

Date Drawn: OCTOBER 16, 2015	Checked by: AP	Figure No. 1
Drawn by: JMM	File Name: NEWTOK F1	

Newtok Shoreline Erosion

Bank Erosion of the Ninglick River (1954-2007) With Erosion Projections (2012-2027)

October 2007



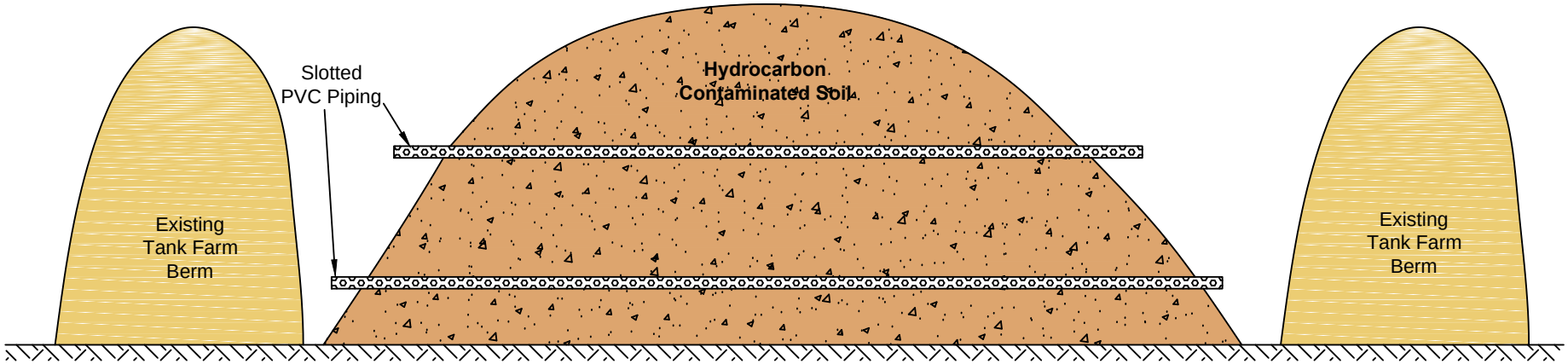
Historic shorelines digitized from USGS topographic maps and digital aerial photos. Projected shorelines are from statistically derived averages and have not been calculated based on actual Ninglick River data. Therefore, conservative erosion rate values were used for these projections, ranging from 36 ft/yr (west/downstream) to 83 ft/yr (east/upstream). Actual observations by residents and raw, non-averaged data indicate periods of much higher erosion rates. July 2003 shoreline represents a rate of 110 ft/yr.

Reference: Alaska Department of Commerce, Community and Economic Development, Newtok Planning Group Website

HOBBIT ENVIRONMENTAL

PROJECTED SHORELINE EROSION
NEWTOK, ALASKA

Date Drawn:	Checked by:	Figure No.
MAY 26, 2016	AP	2
Drawn by:	File Name:	
JMM	NEWTOK F1	



HOBBIT ENVIRONMENTAL

PASSIVE BIOPILE DESIGN SCHEMATIC
NEWTOK, ALASKA

Date Drawn:	Checked by:	Figure No.
MAY 26, 2016	AP	3
Drawn by:	File Name:	
JMM	NEWTOK F1	