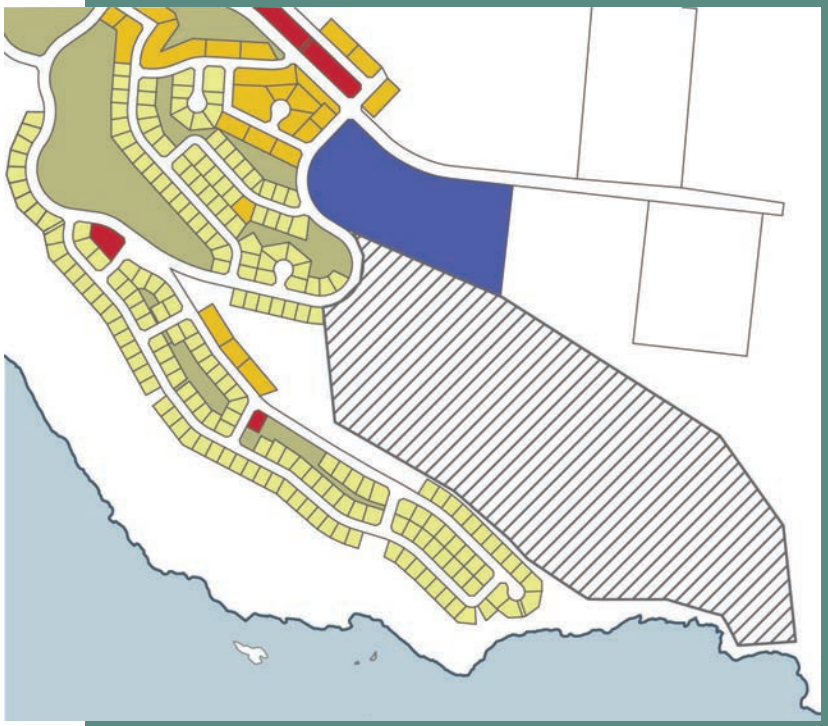

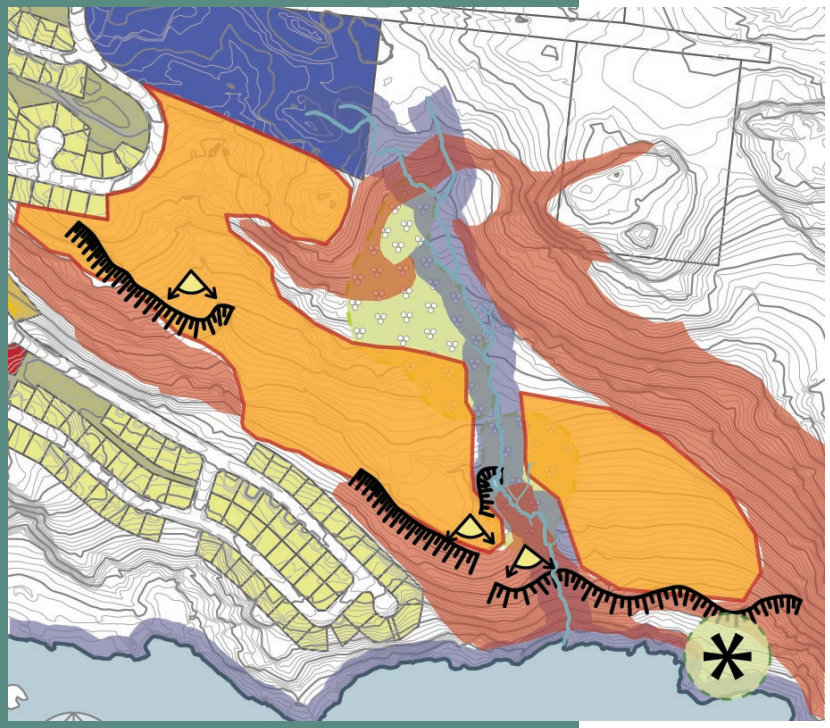

Subdivision Design Manual:

Guidelines and Standards for Nunavut Communities

Second edition
March 2019

Subdivision Design Manual:
Guidelines and Standards for Nunavut Communities

Prepared for:

Planning and Lands Division
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Prepared by:

Lichen Consulting Inc.

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Northern Futures Planning

PREFACE

Facing climate change challenges head-on

Originally produced in 2010, this manual remains an important tool for those who design subdivisions in the unique climatic, cultural, and land ownership environment of Nunavut communities. These communities have a distinct urban form and follow a particular development process, making them different from communities in other parts of Canada.

This edition describes the process of selecting a development area and provides subdivision design guidelines and standards in the context of a rapidly changing North. It identifies the community-level impacts of climate change and shows how communities can grow while remaining resilient.

New subdivision design practices have been developed to make use of climate change adaptation tools. In new sections, this manual describes these tools in order to show how subdivision design can be used to help communities adapt to climate change.

Community planners need subdivision design guidelines and standards so they can anticipate and better respond to climate change impacts in their communities.

Furthermore, this edition incorporates Northern Infrastructure Standardization Initiative (NISI) standards used to analyze subdivision design and undertake drainage planning.

Purpose of the Manual

The goal is for Nunavut communities to follow best practices and apply a consistent approach to subdivision design. This manual is a reference and guide for designing subdivisions in Nunavut communities. It guides those working on subdivision design through the process of selecting a site for development, then designing the roads and lot layout. The manual also provides relevant subdivision design standards. Its intended users are Community and Government Services (CGS) Planning and Lands Division staff and their municipal partners throughout the territory.

In Nunavut, CGS community planners design most subdivisions with on-the-ground support from local municipal staff. In particular, local municipal Planning and Land Administrators (PLAs) are key partners in subdivision design. CGS community planners and local PLAs work together to design subdivisions.

The manual defines subdivision design roles and responsibilities, including those of the public, the municipal council, and CGS staff. It outlines key geographic characteristics, such as drainage, slope, and soil type, to determine whether or not an area is suitable for development. Plus, the manual provides Arctic-specific best practices for road and lot layout.

How the Manual is Structured

The manual has four parts:

Part A: The Subdivision Planning Context begins with a discussion of the Planning Act and describes the community planning tools which impact subdivision design. Relevant climate change policies are also reviewed.

Part B: Selecting a Development Area identifies the steps needed to prepare for community expansion including determining how many lots are needed and for which uses.

Part C: Subdivision Design Guidelines provides detailed guidelines to follow when designing a subdivision, starting with determining the build zones and then designing the build zones.

Part D: Subdivision Standards contains the applicable standards for the design, location, and layout of roads, as well as the size and shape of lots.

Although the manual is to be used by all Nunavut communities, its practical application can be adapted to meet the needs of each community's unique situation. In those cases where subdivision design practices need to be different from these best practices, the reasons should be discussed in the community planner's report submitted with the subdivision design.

Users are encouraged to suggest changes, additions, and improvements to this manual. For possible inclusion in a future edition, suggestions should be forwarded to the Manager of Community Planning in the Planning and Lands Headquarters in Kugluktuk.

Contents

Part A

THE SUBDIVISION PLANNING CONTEXT

Introduction

This part outlines the legislative and policy framework, which provides the authority for land use planning in municipalities. The roles and responsibilities for developing new subdivisions are also discussed. Throughout this part, consideration is given to the impacts of climate change on the growth and development of Nunavut communities.

AUTHORITY FOR LAND USE PLANNING

In Nunavut, the authority of the local government to make community planning decisions is provided by the Nunavut Planning Act. The Act defines how to undertake community planning and identifies the main actors in the process. The Planning Act applies to all lands contained within the municipal boundary. The Act sets out the approval process for subdivision surveys.

The Nunavut Agreement (NA) is another important document that provides guidance on land development issues in Nunavut. In particular, Article 11, Part 2 of the NA sets out the principles, objectives, priorities, and policies that guide land use planning.

Several other regulations and pieces of legislation also influence subdivision design and land use decisions at the community level even though they do not address community planning directly.

These include:

- **Hamlets Act and Cities Towns and Villages Act:** These two acts define the powers of local government with respect to taxation and finance, council procedures, and administration. These acts also enable municipalities to prepare and adopt land administration by-laws, land acquisition by-laws, as well as land disposal by-laws. For example, a land administration by-law allows municipalities to collect lease rentals for their land development reserve funds.

- **Public Health Act and General Sanitation Regulations:** These regulations specify minimum setback requirements from waste disposal sites.

- **Environmental Protection Act:** This act regulates contaminant discharges into the environment and gives local government power over the cleanup of “unsightly lands”.

- **Aeronautics Act and Airport Zoning Regulations:** These regulations govern height and construction methods for buildings located along airplane runway approaches and areas affected by airport activities.

- **Land Titles Act and Land Titles Plan Regulations:** These regulations establish land document registration and survey plan procedures. This allows lots to be titled and land transactions to be registered at the Land Titles Office in Iqaluit.

- **Canada Land Surveys Act and Regulations:** These regulations establish the procedures for surveying lots in the community.

LOCAL COMMUNITY PLANNING TOOLS

The Planning Act provides the local government with the tools for determining how community land is used and developed in the present and future. These tools include several types of plans:

- the community plan (also called a general plan)
- the zoning by-law
- the subdivision plan

This manual focuses on how to develop a subdivision plan.

The community plan and zoning by-law

The community plan guides the community's physical development, presenting a picture of how the community wants to develop in the years to come. Generally, the plan indicates how and where the community's population is expected to grow over a 20-year period. More specifically, it shows where housing, stores, schools, water reservoirs and landfill sites will be located. It also indicates areas of community expansion, and when new lots will be available to residents.

The zoning by-law contains the rules that ensure each lot is developed consistently with the vision established in the community plan.

Typically, community plans and zoning by-laws are reviewed every five years. The key benefit of a community plan and a zoning by-law is that they can better assist the municipal council and the PLA when making community development decisions. The by-laws also serve to enforce those decisions. Both the community plan and the zoning by-law address all lands within the municipal boundary.

Most municipalities have a community plan presented in a poster format, known as a "poster plan". The plan contains maps, which illustrate how the lands within the municipal boundary are to be developed and used according to the community plan and zoning by-law. Usually the poster plan also provides the policies and zoning regulations that apply to each type of land use.

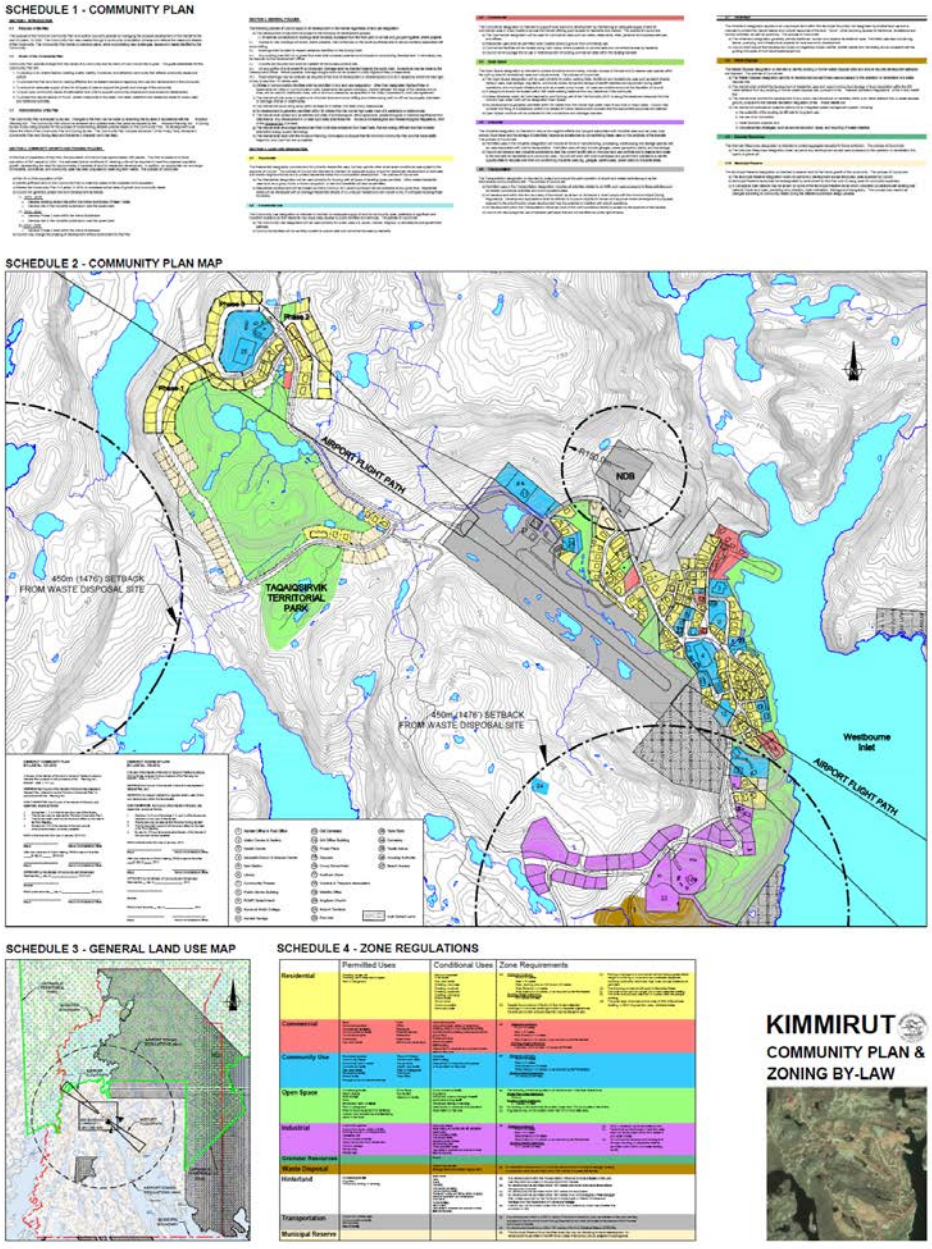

Figure 1: A Poster Plan version of the community plan and zoning by-law for the Hamlet of Kimmirut

The subdivision plan

The subdivision plan is more detailed than the community plan. It addresses only a small area of the community, which is typically located close to the built-up area. The subdivision plan lays out how to divide an area into building lots, as well as showing the location of the roads that will access these lots. Subdivision plans are more often prepared for vacant and undeveloped areas; at times, however, they address areas that are already developed.

The survey sketch for a subdivision shown in figure 2 is an example of a subdivision plan for a new development area in Kimmirut. When municipal staff submit a subdivision plan for CGS approval, it should be submitted in this survey sketch format. CGS staff provide the template for the survey sketch.

The development scheme

Another planning tool provided by the Planning Act to Nunavut communities is the development scheme; however, this tool is typically only used by larger communities and even then is uncommon. Compared to a subdivision plan, the development scheme provides more detailed policies and concept plans for the development of specific areas within the municipality.

A development scheme is like a mini-community plan for an area of the community that is proposed for development. A development scheme is used if special rules are required for building in the area. Development schemes cannot violate the community plan and are often integrated into the existing community plan and zoning by-laws.

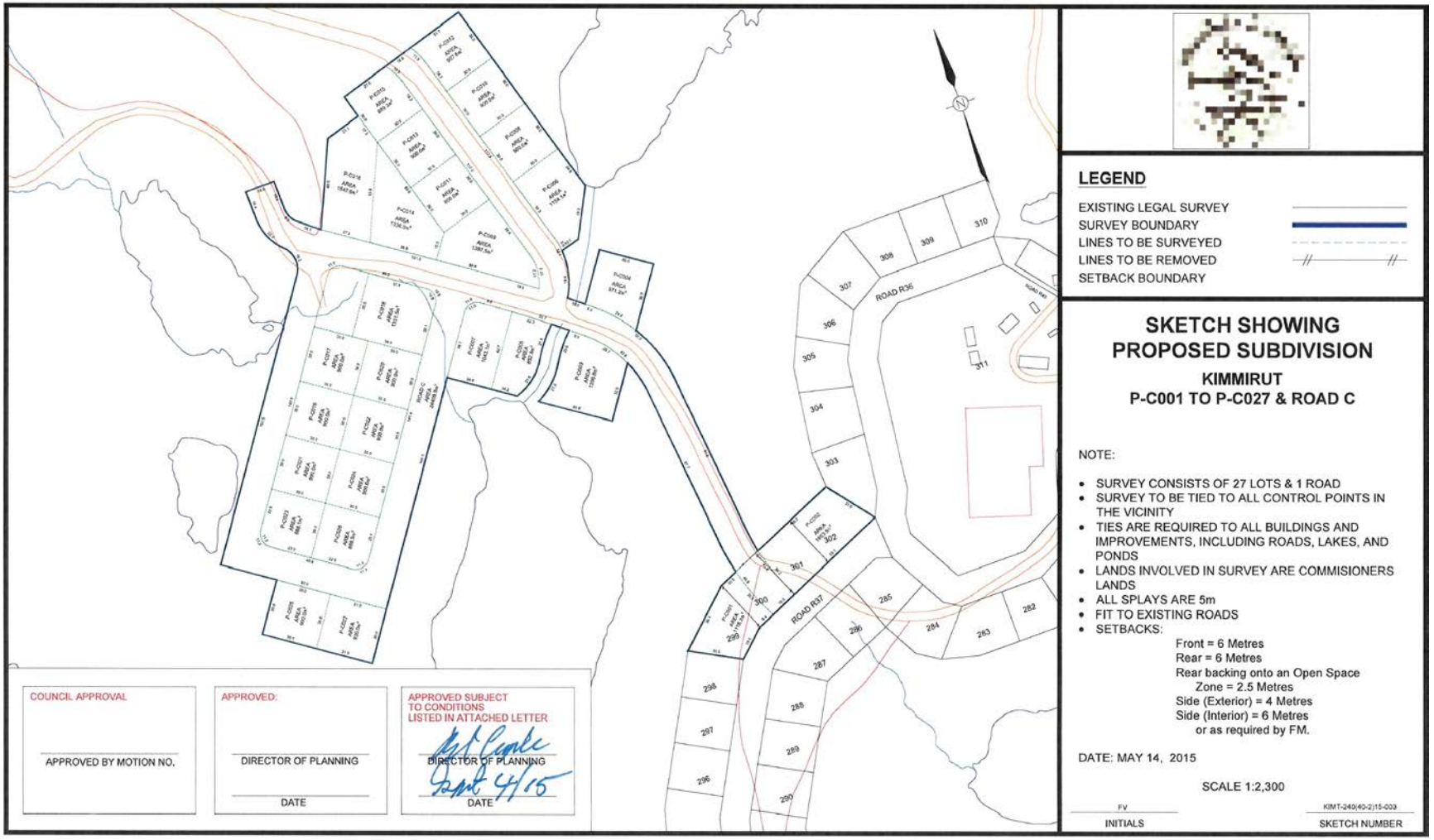

Figure 2: The Survey Sketch for a subdivision in Kimmirut

Northern Infrastructure Standardization Initiative

The Standards Council of Canada has developed building standards to help communities across the North adapt to climate change. These standards are being developed through the Northern Infrastructure Standardization Initiative (NISI). The standards guide the design process for community infrastructure, including drainage systems and roads, new buildings, and maintenance programs. All subdivision design in Nunavut should follow these standards. The standards recommended in Part D of this manual summarize and build on the NISI standards.

Currently, five standards have been developed, addressing:

- Thermosyphon foundations
- Reduction of the impact of permafrost thaw on existing buildings
- Management of snow build-up on and around buildings
- Community drainage systems
- Geotechnical studies

Additional standards will continue to be developed, providing communities with additional guidance on how they can grow and adapt infrastructure and buildings. To access these standards and additional training on these standards, visit https://www.scc.ca/en/nisi or contact the Climate Change Secretariat or CGS Planning and Lands.

ROLES AND RESPONSIBILITIES

Municipalities, including the municipal council, local staff, and community residents, have the primary responsibility for preparing community plans, zoning by-laws, and subdivision plans. The Planning and Lands Division of CGS oversees and assists with community planning in each municipality.

Adopting community plans and zoning by-laws requires the approval of the Minister of CGS. Similarly, subdivision plans require the approval of the CGS Director of Planning and Lands.

CGS staff — specifically, the regional community planners — are responsible for assisting communities with the development of these plans. Occasionally, other contributors, such as planning and engineering consultants, assist the community with preparing these plans.

Part of CGS Planning and Lands' mandate is to ensure that the anticipated impacts of climate change are incorporated into future plans. That is why CGS assists local staff and communities by producing land studies and community planning services, such as subdivision design, in order to anticipate and respond to climate change challenges.

Established by the Government of Nunavut in 2016, the Climate Change Secretariat (CCS) acts as the coordinating body to help Nunavut take action on climate change. CCS works with communities to identify climate change concerns and assist hamlets in dealing with them.

The CCS also works with communities to reduce greenhouse gas emissions through energy efficiency and alternative energy projects. In addition, it provides funding and support to enable the Planning and Lands Division to identify new climate change tools that can be included in planning and land development.

ADAPTING SUBDIVISION DESIGN FOR CLIMATE CHANGE: THE BROADER CONTEXT

The Government of Nunavut (GN) is committed to helping communities become more resilient as they adapt to the effects of climate change. In 2016, the GN signed the Pan-Canadian Framework on Clean Growth and Climate Change - a framework that identifies actions to build climate change resilience. This manual focuses on two of the framework's key actions:

> Integrating "...climate resilience into building design guides and codes." (Section 4.2, Action 2: Develop climate-resilient codes and standards)

> Strengthening "…northern capacity for climate change adaptation…" (Section 4.4, Action 2: Building climate resilience in the North)

This manual also supports the GN territorial policy on climate change adaptation described in the 2011 document Upagiaqtavut Setting the Course: Climate Change Impacts and Adaptation in Nunavut. Specifically, the manual is aligned with one of the document's key objectives:

> To "ensure climate change considerations are integrated into land use planning." (Napuk/focus area 4, Objective 4.2)

The Upagiaqtavut policy also describes how the GN's Inuit Qaujimajatuqangit (IQ) principles apply to climate change adaptation. Two of the main IQ principles which guide this manual are included below:

> "Community members will have meaningful opportunity to share ideas and participate in decision making for subdivision designs which affect them and their communities." (Aajiiqatigiinniq – Decision making through discussion and consensus)

> "Communities will adapt to the impacts of climate change on new subdivisions to ensure the long-term sustainability of Nunavut's people and the land." (Avatittinnik Kamatsiarniq – Respect and care for the land, animals and the environment)

What's more, the GN is investing in studies and plans to help communities adapt to climate change. This manual clarifies how and when communities can use this information to better manage lands and infrastructure. By improving the basis for more informed decisions about the impact of climate change on the subdivision development process, communities will be able to reduce costs and limit infrastructure damage.

Part B

SELECTING A DEVELOPMENT AREA

Introduction

Before a subdivision plan can be developed, the subdivision design team must work with the community to select the area where the new subdivision will be built. This stage includes: gathering information about the land, confirming local and territorial government approvals are in place, and consultations involving the public and other participants are held. This part outlines the six steps involved in selecting a development area.

OVERVIEW OF THE STEPS TO SELECTING A DEVELOPMENT AREA

The municipal council is responsible for initiating the design of a subdivision plan. In cases where the community has an up-to-date community plan, the plan usually provides sufficient guidance on future development areas. It also provides direction on when the municipal council should initiate the development of each area. In most cases, the plan will even suggest a conceptual layout of the roads and lots for each of the future development areas, which will be confirmed or changed during the subdivision planning process.

When it's time to initiate the design of a subdivision plan, community staff must advise CGS staff — in particular, the regional planner — to request assistance. With the regional planner's professional expertise, the community can seek the regional planner's advice throughout the entire design process.

Whether or not a subdivision plan is prepared for an undeveloped area or for the re-development of an existing area, the process for designing the subdivision plan is the same. This manual focuses on the design of subdivision plans for new expansion areas.

Even if the community plan is up to date, it may not reflect current conditions. Furthermore, it is important to remember that the direction provided by the community plan is general. As a result, more analysis is usually required when a new subdivision plan is initiated. Further analysis ensures that the area identified for development in the community plan makes sense. Questions asked might include:

- Does the plan address the current needs of the community, such as the requirement for new lots?
- Will the development area be more difficult or costly to develop?
- Do the residents prefer one area for development to another?
- What are the barriers to development?

Whether or not the community proceeds with the development of the area identified in the community plan, all subdivision plans must conform to the community plan.

During the pre-design stage of developing the subdivision plan, an area must be selected where the community wants a new subdivision. Developing a subdivision requires the creation of new lots, the construction of roads to access these lots, and the extension of services, such as power lines, to these lots. Indeed, selecting the area where the community will develop a new subdivision requires a number of decisions. This part of the manual describes the six steps to take when selecting the site to develop:

Step 1: Assess the Need for New Lots

Step 2: Refer to Existing Plans and Studies

Step 3: Confirm Land Ownership

Step 4: Add Landscape Hazards to the Opportunities and Constraints Map

Step 5: Estimate Development Costs

Step 6: Consult and Learn from the Community

STEP 1: ASSESS THE NEED FOR NEW LOTS

Before the community selects the next area to develop, it is important to determine whether new lots are needed, as well as what types of lots need to be created in order to accommodate community growth. This includes an assessment of the actual and projected demand for lots by land use type. In new subdivisions, these types often include: residential, community use, commercial, open space and industrial. When assessing the demand for lots, it is best to plan for a minimum 5-year supply. Council should make available to residents the right mix of lots for various land uses — at the right time and in the right location.

The number of lots needed depends on population growth. All community plans include figures that show the historical rate of population growth and how it is expected to increase over the life of the plan. If the community does not have an up-to-date community plan, the information about the community's past and future growth rate can be found on the Statistics Canada and Nunavut Bureau of Statistics websites.

The rate of population growth is expressed as a percentage — for example, 2.5% per year. The historical rate of growth indicates how much the population has grown each year in the past. The projected rate of growth indicates how much the population is expected to grow each year in the future. Because it is difficult to pinpoint the exact rate at which the population will increase in the future, three scenarios are usually considered: a low rate, a medium rate and a high rate of growth. For the purpose of this discussion, one rate is considered — the medium rate.

Knowing how the population is expected to increase each year enables the municipal council to determine the demand for new lots for each type of land use. Table 1 shows a community's yearly projected population from 2020 to 2024.

Table 1: Sample population projection and forecast of residential units needed

5-year period	Projected Population*	Residential Units** Needed	Number of additional units needed
2020	1,007	296	7
2021	1,030	303	7
2022	1,054	310	7
2023	1,078	317	7
2024	1,103	324	7
	Total additional units for 5-year period		35 units

* Growth rate of 2.3%

**Occupancy is 3.4 persons per household.

In many communities, housing shortages and overcrowding — particularly of social housing — are important issues. Where overcrowding is a community concern, the Nunavut Housing Corporation (NHC) should be contacted to inquire about plans for building new social housing units. Depending on the NHC's responses, the number of additional units needed each year may need to be adjusted. The local public housing manager should also be interviewed to confirm the present social housing waitlist.

Step 1.1 Assess the need for residential lots

When planning a new subdivision, the municipal council should aim to provide a variety of housing opportunities to meet the needs of all residents. The task is to determine how much new housing is needed and of which type.

Determine the number of housing units needed

Assume that we confirmed the projected rate of growth of the community. In our example it is 2.3% between 2020 and 2024. In addition, we will need to know the number of people living per household in the community. The number of people per household tells us how many people typically live together under the same roof. That figure is available through Statistics Canada and the Nunavut Bureau of Statistics. Let's say that there are 3.4 people per household in the community. Table 2 illustrates how to calculate the number of housing units needed each year by combining the projected rate of growth and the number of people per household. The result tells us that a total of 35 housing units are required to meet the demand of the growing population over the next five years. Although in the sample only a period of 5 years is covered, in practice it is best to extend the calculations to 10 to 15 years to provide better insight on future housing needs.

Assume that the community social housing waitlist includes 13 residential units. This means that people in the community have requested 13 social housing units, and that they have been deemed to be eligible to have these units once they are built. Determining the number of housing units available requires that the existing waitlist be added to the projected future housing demand. In this case, 48 housing units (35 + 13) are required to meet the housing demand over the next five years.

Figure 3: Single detached dwelling

Figure 4: Row dwellings

Determine the desired mix of housing types

The municipal council must also provide a variety of housing opportunities to meet the demands of all residents. A school board, for example, may want to construct a small apartment building to house its teachers. Similarly, the NHC may want to construct a 5-unit row house for social housing. And residents, for their part, may want to build single-family homes. So how is the mix of housing types determined in order to meet a variety of community needs?

To calculate this figure, refer to the Statistics Canada's Census records for your community. Table 2 illustrates the types of data the census provides on housing supply and type. The census also provides the percentage of each dwelling type present in the community.

Table 2: An example of census data on housing types that is available in a community

Housing Type	Percentage
Single-detached	34%
Semi-detached	22%
Row housing	35%
Apartments	9%
Total	100%

Maintaining the current proportion of housing types is unlikely because the demand for housing types changes. For instance, at one time, the NHC built mostly single-detached homes. More recently, however, its most common dwelling type has become the five-unit row house. Because the cost of constructing each row unit is significantly less than the cost of a single-detached unit, NHC's approach has allowed it to build more units overall.

A lack of good land or granular resources are other factors that may encourage communities to promote more apartments and row houses. This results in more efficient land use and reduces land development costs. That is why community planners should speak with all organizations — local and otherwise — that play a role in community housing construction. These organizations can also share their own plans for housing development.

Once the targeted mix of housing types needed for the community is determined — based on research, analysis, and the community planner's discussions with the municipal council — it is time to calculate the number of units needed by type. Table 3 provides an example.

Table 3: An example of the desired proportion of housing types in a community

Housing Types	Target Housing Percentage*	Total Housing Needs
Single-detached	25%	12 units
Semi-detached	25%	12 units
Row housing	50%	24 units
TOTALS	**100%**	**48 units**

*Approximate values for illustration

In summary, to accommodate the projected population growth, the community needs 48 new housing units between 2020 and 2024. Based on community-specific analysis, the best mix of housing types is 12 single-detached units, 12 semi-detached units, and 24 row-house units.

Calculate the residential land requirements

The next step for choosing where to develop the residential subdivision is to determine how much land is required to build the 48 units. To calculate how much land is required, the data about housing needs and the data about density for each housing type must be combined. The density shows how many units can be built on a hectare of land. Net density means that the hectare of land does not include roads; it only includes the lots that the buildings will sit on. The densities in Table 4 have been calculated using the standard lot sizes common in Nunavut for each of the three housing types (see Part D, Standard 24 - Size of Residential Lots for information on typical residential densities and how to calculate density). The density for each housing type is included in Table 4.

Table 4: Sample calculation of residential land need

Housing types	Target housing (percentage)	House required (units)	Net density for trucked service (units/hectare)	Net development land (hectares)
Single-detached	25%	12 units	13 u/ha	0.9 ha
Semi-detached	25%	12 units	22 u/ha	0.6 ha
Row housing	50%	24 units	31 u/ha	0.8 ha
TOTALS	100%	48 units	21 u/ha	2.3 ha

Table 4 shows that the total area of land required to build the 48 housing units is 2.3 hectares. It also shows that the overall development density is 21 units per hectare (i.e. 48 units/2.3 ha). In cases where details of the unit type are unknown or difficult to project, an overall density of development can be assumed. In Nunavut communities on trucked services, the density of development is typically between 20 and 30 units per net hectare.

Step 1.2 Assess the need for community lots

The need for community lots in a new development area is usually based on a list of anticipated community needs. Among other needs, these include a new school, daycare centre, community hall, recreation facility, baseball diamond, and playground.

Determine community needs

Community needs should be identified in the community plan or in the background report of the community plan. The identified needs should be confirmed through community consultation, interviewing municipal staff, and by checking the community's 5-year capital plan.

Calculate the community land requirements

Most community uses have a minimum lot area. Larger buildings and outdoor recreation facilities often require reasonably flat land for the building and the parking area. Table 5 provides typical land requirements for specific uses. A range is provided based on the building's or facility's size. For other community and recreation facilities not listed in the table, the building footprint, yard setbacks, and parking requirements should be considered in the estimation of a land requirement.

CGS Planning and Lands maintains a mapping system which can be accessed online at https://pals.cgs-pals.ca/. The system contains zoning, land ownership and satellite images. The Canada Lands Survey Record Number is displayed for each lot in the system which is linked to the Natural Resources Canada Website at www.clss.nrcan.gc.ca/map-carte-eng.php

Figure 5: Community Learning Centre

Figure 6: Playground

Table 5: Typical land requirement by facility

Facility	**Land Requirement**
Elementary School	1 hectare
High School	1.5 – 2 hectares
Community Learning Centre	1,000 – 2,500 m^2
Health Centre	4,000 – 7,500 m^2
Community Hall	3,000 – 5,000 m^2
Hockey arena	3,000 – 5,000 m^2
Basketball court	500 – 750 m^2
Baseball /softball diamond	2,500 – 5,500 m^2
Soccer field	3,000 – 7,000 m^2
Neighbourhood playground	2,000 – 5,000 m^2

Step 1.3 Assess the need for commercial lots

The need for commercial lots is based on specific needs or as a portion of the 20-year requirement. Both methods are discussed below.

Assess specific needs for commercial land

Consultation with the business community, developers, and the broader community helps to determine the demand for commercial lots over the next 5 years. For example, if the Co-op says it wants to build a new 2,000 m^2 store, the land requirement for such a store (including storage, loading, and parking areas) should be added to the list. Worthy of note is that the location of the new subdivision and its relationship to the existing community can influence whether or not the new area will attract new businesses.

Calculate commercial land requirements as a portion of the 20-year requirement

The commercial land need can be assessed by adding up the demand for commercial lots, as noted above. The second way to determine the land requirement is to consider how much commercial land the previous calculation in the background report says is required over the next 20 years. If the subdivision is intended to provide a five-year supply of commercial land then it should include one quarter (5 years divided by 20 years) of the total commercial land called for over the next 20 years. For example, if the background report requires 4.0 hectares of commercial land over the next 20 years, at least 1.0 hectare of commercial land should be provided in the new subdivision for the next 5 years.

Figure 7: Bank, Retail Store

Figure 8: Restaurant

Step 1.4 Assess the need for industrial lots

Industrial subdivisions are typically separated from subdivisions for residential, community and commercial uses due to the nuisances and public safety issues that are often associated with industrial uses. These include noise, dust, fumes, heavy truck traffic, outdoor storage of equipment and supplies, and unsightliness. Much like other land uses, it is important to maintain a supply of vacant industrial land so that new uses can be built in appropriate locations. Also by maintaining the land supply, opportunities are made available to relocate existing industrial uses out of the older part of town (uses such as warehousing and service garages). This can happen when the expansion or upgrade of an existing facility is being considered.

Determine the demand for industrial lots

Consultation with the business community, government, and other organizations can help to determine the five-year demand for industrial lots. For example, a mining company conducting exploration work near the subdivision may want to build an industrial lot to store bulk fuel and other supplies in sea containers. Similarly, a municipality may want to relocate a service garage from the town's center to an industrial area. Uses such as these should be added to the list of land needs. Generally, industrial lot sizes start at 2,000 m^2 (0.2 hectares) but can be significantly larger depending on the use being considered.

Calculate the industrial land requirement

The industrial land need can be calculated by adding up the demand for industrial lots as identified above. A second way to calculate the land requirement is to express the requirement as a portion of the total land requirement identified in the community plan or background report. If, for example, the industrial subdivision is intended to provide a five-year supply of the 20-year industrial land requirement of 10 hectares, a minimum of 2.5 net hectares should be set aside for industrial lots.

Figure 9: Sea Container Storage Area

Figure 10: Building Supply Storage

Step 1.5 Summarize the land needs

After calculating the amount of land needed for each of the land uses of a new subdivision, these needs can be summarized in a table. Here it is important to note that rights of way for roads typically consume an additional 15 to 20% of the land requirement. Table 6 lists the land needs for a new subdivision designed to accommodate 48 housing units, as well as some community, open space, and commercial uses. The table indicates that the new development area should be at least 4.8 hectares in size in order to accommodate these future uses.

Table 6: Sample calculation of total land needs for a new subdivision

Lot type	**Facility**	**Land Required**
Residential	48 housing units (average 21 units/hectare)	2.3 ha
Community Use	Elementary school Community learning centre	1.0 ha 0.2 ha
Open Space / Recreation	Basketball court Playground	0.1 ha 0.2 ha
Commercial	Retail store Take-out restaurant	0.4 ha
Industrial	N/A	N/A
	Subtotal Land Needs	**4.2 ha**
	Roads (15% of subtotal)	0.6 ha
	Total Land Needs	**4.8 ha**

It is possible that the community may express virtually no demand for commercial or industrial lots. This is especially likely in smaller communities. In this case, a minimum of two or three lots, sized to flexibly accommodate a variety of potential uses should be included in the land needs calculations. These lots will provide for commercial or industrial uses that arise suddenly. Ensuring a minimum supply of developed lots ensures that the community will not have to turn away opportunities for good businesses and employment because of a lack of available lots.

STEP 2: REFER TO EXISTING PLANS AND STUDIES

Once the land requirements of the new subdivision have been calculated, the community plan should be consulted for further direction. Other municipal or GN plans, documents, or studies may also be available that provide direction or further information relevant to the selection of the most appropriate area for a new residential subdivision. Consulting these other plans is particularly important if the community plan has not been recently updated. These other plans may provide more current information on the community's needs or further insight into potential constraints, such as issues relating to snow drifting and drainage.

The Community Plan

The community plan map typically includes at least one new subdivision area designated for future community expansion. Even though the community plan indicates a preferred phasing sequence, additional investigation may reveal that a later phase is more suitable to develop first. This sequencing decision depends on a number of factors likely to be described in the community plan. These factors include finding a location that:

- Accommodates a subdivision of the right size that suits the needs of the community.
- Integrates with the existing community. For example, an area located close to the existing community is preferable to an area located further out.
- Meets community preferences. For example, residents may prefer an area located close to the shore instead of farther inland even though the inland location is more easily accessed.

- Costs too much to develop: For example, the community's financial resources are limited and the cost of developing a subdivision (such as building roads and installing power lines) is an important community consideration.

The Community Plan Background Report

A background report is drafted before a community plan is developed or updated, and finalized when the new plan is completed. Although the background report is not part of the plan, it is a source of information on the factors that have led to the community's selection of future growth areas.

The report will describe anticipated population growth and outline future land needs for residential, commercial, institutional and industrial activities. The report will clearly document all the plans and studies that were available and reviewed at the time the community plan was updated. This gives a good starting point to know what resources are available. Also, the background report may contain a discussion of the various future development areas and any particular opportunities and constraints associated with them.

The Opportunity and Constraints Map

As part of the community plan update process, an opportunity and constraints map is often produced as part of the community planning exercise. If available, this map should be carefully reviewed to better understand community characteristics that may impact subdivision development in future growth areas.

Examples of constraints that may be included on an opportunity and constraints map include:

- Proximity to waste disposal sites and/or sewage lagoons (i.e. 450 metre setbacks, according the General Sanitation Regulations of the Public Health Act)
- Existing facilities on the land that would need to be relocated (i.e. communications installation)
- Presence of water bodies that should not be filled and developed (which may include shallow and seasonal water bodies)
- Presence of cultural heritage resources
- Presence of aggregate resources (to prevent them from being built upon, so that they can be accessed and used)
- Inability to provide a safe and secure road connection or connections to the new development area at a reasonable cost
- Inability to extend piped services to the new development area (applicable to communities on piped services) at a reasonable cost
- Proximity to a watershed that protects the community's source of water from pollution
- Presence of drainage concerns or land prone to flooding or permafrost thaw

Figure 11 shows an opportunity and constraints map for Rankin Inlet. The map indicates the location of Inuit Owned Land, airport approaches, communications systems, watershed for the community water supply, and potential incompatible uses such as quarries, tank farms, cemetery, etc. Opportunity and constraint maps have been developed for each community in Nunavut.

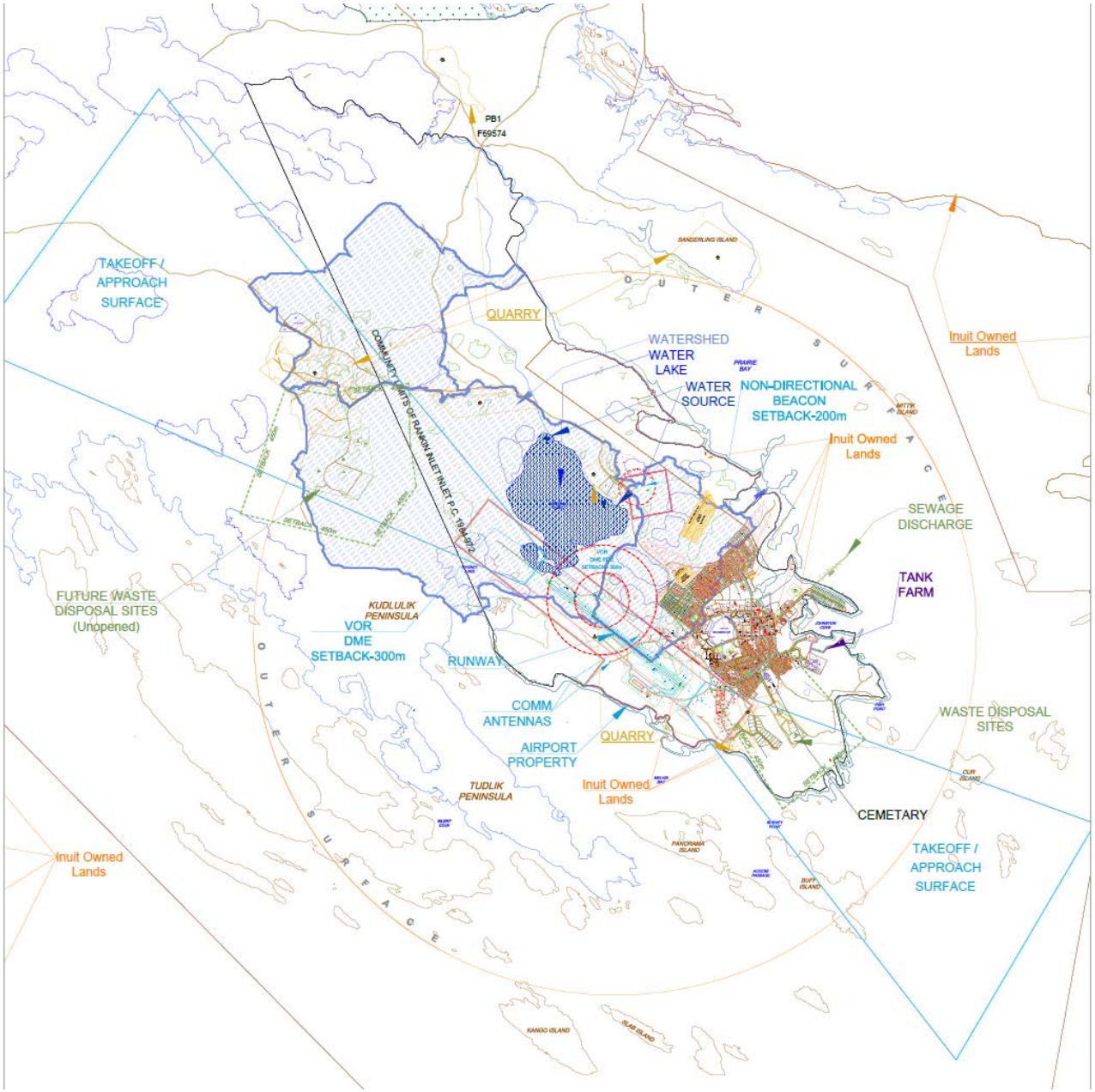

Figure 11: A development opportunities and constraints map for Rankin Inlet.

Terrain and Climate Studies

Various terrain and climate studies may have been completed for all or part of the community.

Furthermore, the impacts of climate change on precipitation and permafrost mean that communities need to carefully monitor ground stability and drainage. If municipal staff and community members have concerns about ground stability or drainage in the community or future development area, these studies may have been done or more need to be done. Typical studies include:

- **Geotechnical studies** – to determine if the soils are suitable for development and to inform infrastructure design.
- **Snowdrifting Study** – identifies those areas vulnerable to snow drifts and provides guidance for street layout, building setbacks, and location of snow fencing where snowdrifting needs to be reduced.
- **Drainage Master Plan or Study** – includes drainage strategies for new subdivisions or for the community as a whole. Drainage plans or studies will describe where drainage ditches and culverts are needed to properly manage snow melt and run-off. These studies may recommend practices for effectively managing snowdrifting and the drainage system. These may include snow removal and snow piling practices.
- **Surficial geology map** – shows the type of soil material present at the surface (e.g. bedrock, till, marine sediment, etc.). These maps are helpful in creating more informative permafrost maps. However, on their own, they do provide some indications of soil conditions and suitability for construction.
- **Permafrost hazard map** – identify areas of the community where lands may be unstable due to permafrost thaw. It may be possible to build on these areas but more care is needed in assessing potential risks to buildings and infrastructure. These maps/studies can also identify other hazards such as steep slopes and lands prone to flooding or coastal erosion.

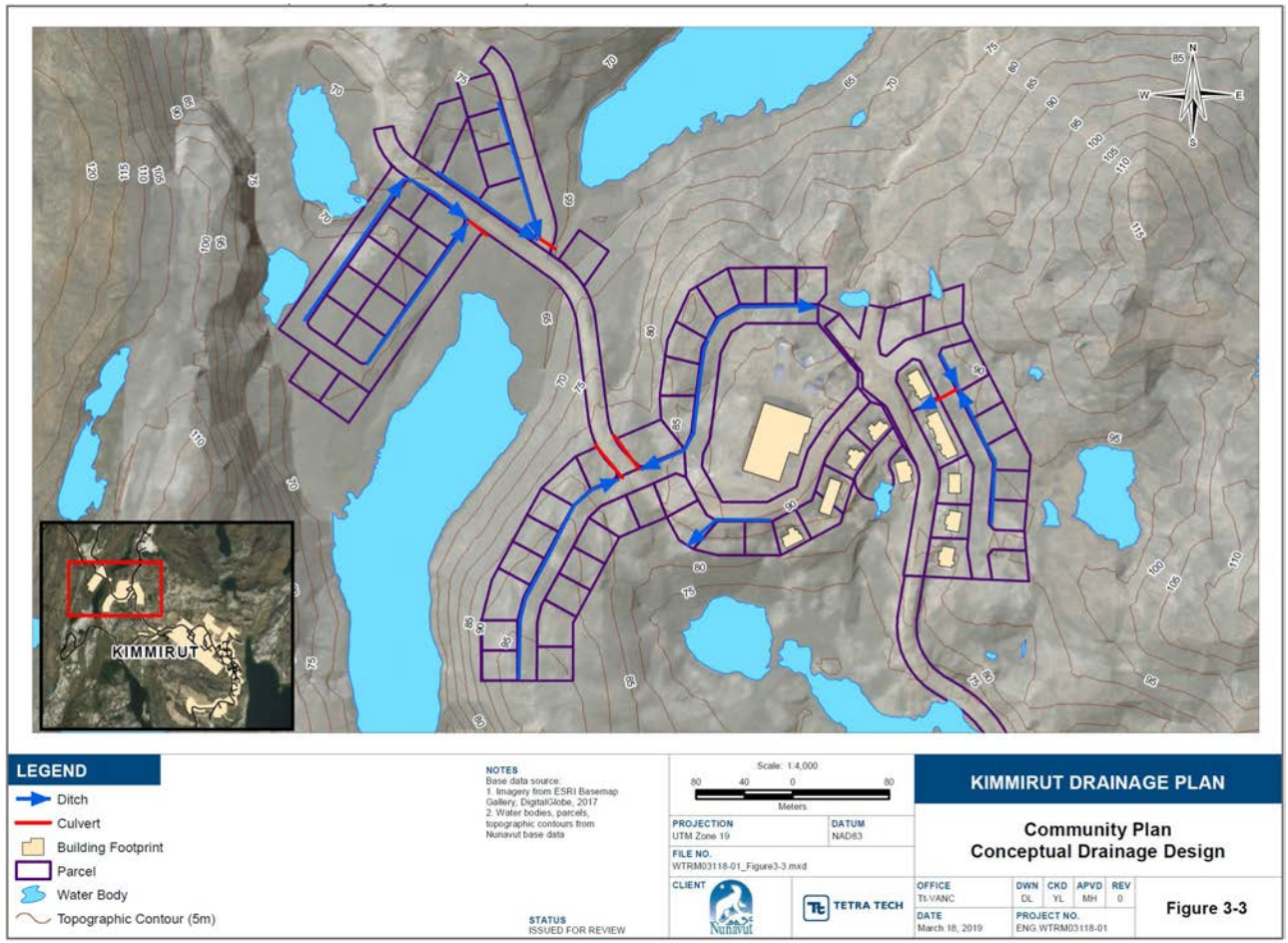

Figure 12: A conceptual design of a drainage master plan for a subdivision in Kimmirut

Other Relevant Plans

Any planning documents or land studies prepared by the GN or a hamlet should also be reviewed. These documents may have recommendations or conclusions that will influence the land requirements or the location of the next subdivision. The following list provides types of useful information that may be found in other relevant plans:

- **Community Economic Development Plan** – may identify a need for new tourist or administrative facilities such as a visitors' centre or new office space to accommodate a government department. The plan may also identify economic trends which will help determine the types of businesses the subdivision may need to provide land for - such as administration offices for mining.
- **Local Climate Change Adaptation Plan** – may recommend avoiding certain areas of the community that are susceptible to erosion or where the permafrost is unstable.
- **Community Sustainability Plan** – may make recommendations about sustainable development practices, such as cautioning against the creation of larger than necessary lots. It may even recommend the reduction of lot sizes in order to make the most efficient use of land available for development.
- **Integrated Community Sustainability Plan** – explains the state of the municipal infrastructure and identifies future infrastructure needs and goals. Can be used to determine the demand for different land uses and availability of developed lots.
- **Community Facility Study** – determines the lifespan of existing municipal buildings and determines when replacement or upgrades are required.
- **Community Wellness Plan** – may identify strategies for improving the community's health and well-being.
- **Community Emergency Response Plan** – may outline potential threats and risks to a community and how the community should respond in the event of an emergency.
- **Community Recreation Plan** – recommends what type of recreational facilities are needed, their size and potential locations.

STEP 3: CONFIRM LAND OWNERSHIP

The process for selecting where a new subdivision will be developed is affected by land ownership. In most cases, the area for development will be un-surveyed municipal land. The Commissioner holds these lands until the municipal government requires the land for community expansion.

In other cases, part or all of the area being considered for a new subdivision may not be municipal land, and may be, for example, Inuit Owned Land (IOL) or federal lands.

Inuit Owned Land (IOL)

IOL are parcels of land owned by a Regional Inuit Organizations (RIO) according to the terms of the Nunavut Agreement. Therefore, development of an IOL parcel requires the approval of the relevant RIO. IOL parcels have been surveyed, so their locations are well known and are shown on the community base maps produced by the GN.

In situations where a promising area for a future subdivision encroaches on an IOL parcel, the community could partner with the RIO to plan and develop the area in a coordinated manner.

An IOL lot may contain special cultural heritage significance, and the RIO accordingly may wish it to remain undeveloped. The RIO should be approached early on in any development project potentially involving IOL to understand the RIO's vision and plans for the land.

Figure 13 illustrates an example of how an RIO could partner with the Hamlet to develop a new area.

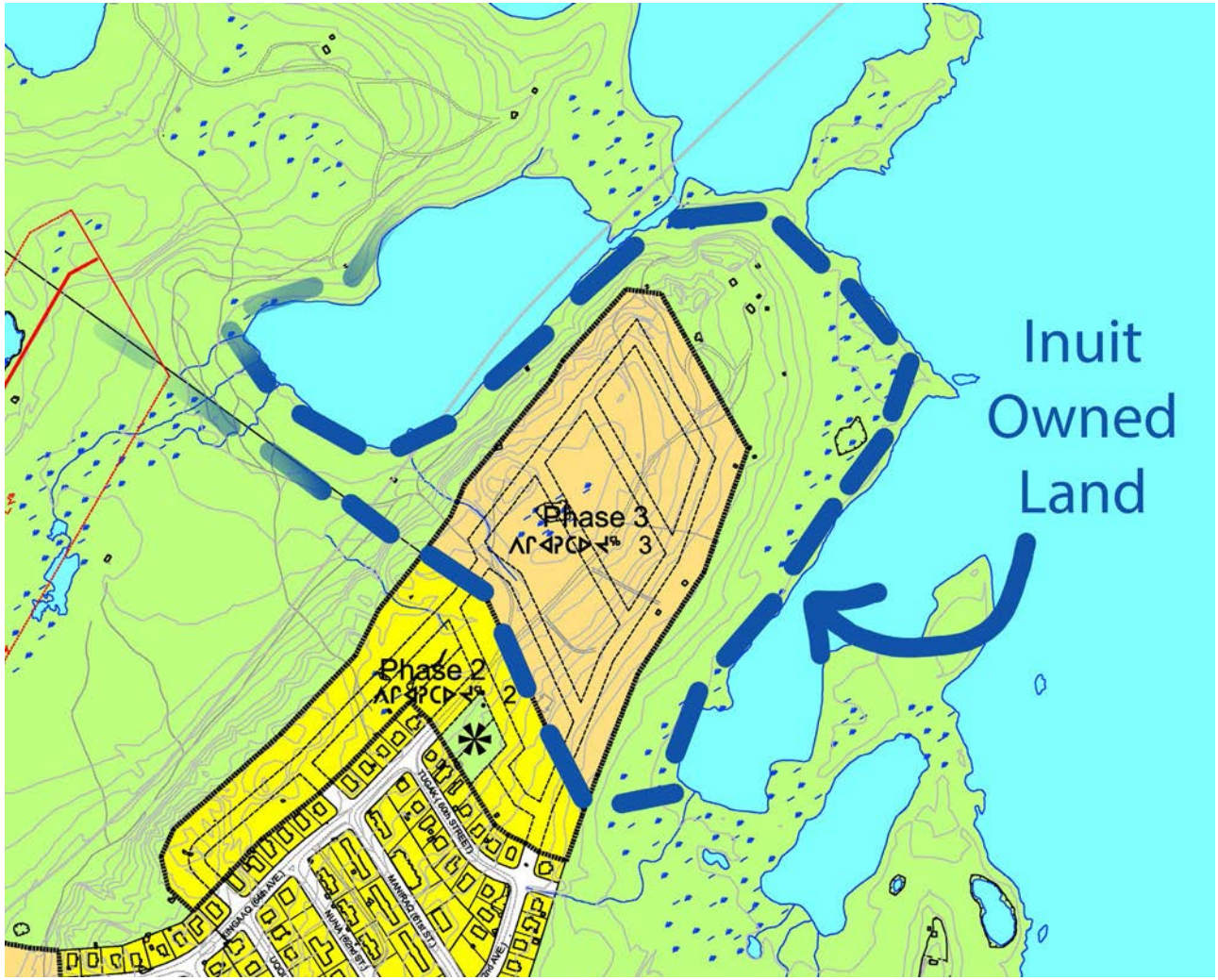

Figure 13: A future development area shown in beige on the Rankin Inlet Community Plan is on Inuit Owned Land so its development would be coordinated with the Regional Inuit Association.

Federal lands and federal reserves

Lands owned, or held in reserve, by the Federal government within municipal boundaries are not available for development and use by the municipality. However, if the department or agency that is occupying the land determines that the land is no longer required the land may be surplused in accordance with Article 14 of the Nunavut Agreement. Surplused land may be used by the municipality.

To determine if a development area includes federal lands, check:

- The Land Inventory
- The Government Exemption List (GEL)
- With the CGS Regional Office
- With Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC)
- With Public Services and Procurement Canada
- The characteristics of the lot

If there is no record of the lot on file, look for visual clues such as weather stations, communications towers, research facilities, accessory buildings, or an area that has been disturbed. The municipality can request that equipment for weather or research stations or communications facilities be relocated. Often equipment relocations benefit the federal government as well as the municipality because community expansion may interfere with these installations. However, the owner of the installation may require the municipal government to fully cover or share the costs of the relocation.

Additional requirements for developing on water bodies can be found in the Nunavut Waters Regulations on the Justice Laws website:

www.laws-lois.justice.gc.ca

Beds of water bodies are also federal lands. If all or part of a water body needs to be disturbed for a development, CIRNAC must be contacted. If the water body is greater than 0.5 hectares, then a Water License will be required from the Nunavut Water Board (NWB).

Filling-in and building upon former waterbodies in Nunavut has historically caused several issues with ground instability, including thaw subsidence (local ground sinking due to permafrost melting) and frost heaving (local ground rising due to permafrost freezing, as water expands when it freezes), causing building foundations to tilt and become unstable as a result.

Waterbodies in Nunavut are often underlain by ice-rich permafrost, which is sensitive to water and temperature changes. Local surface water often keeps flowing into the ground of the former waterbody, because the local topography still directs it there, and this water causes the permafrost to expand or melt. Moreover, the new soils above, which replace the water, change how the permafrost is insulated from the atmosphere and impacts permafrost thaw and re-freezing.

It is generally agreed that Nunavut waterbodies should not be filled-in for new development when at all possible, because the ground instability that results is difficult to manage over the long-term and often results in increased building maintenance costs. When there is no alternative to filling-in waterbodies, the subdivision should be designed with the assistance of a qualified engineer. The engineer should conduct a geotechnical and permafrost study to determine where ice-rich permafrost is present and how, or if, the waterbody can be safely filled-in and built-upon.

Other types of land

The other types of non-municipal lands include:

- Lands within the 100-foot strip (strip of land measured 30.5 m from the ordinary high water mark of seashores and navigable lakes and rivers)
- Lands on the Government Exemption List (GEL)
- Private lands

Generally, development of these lands should be avoided when considering a new development area.

STEP 4: ADD LANDSCAPE HAZARDS TO THE OPPORTUNITIES AND CONSTRAINTS MAP

Climate change increases the risks of land hazards. Communities must select development areas that avoid these hazards or adopt a subdivision design that reduces the impacts of hazards. Before the subdivision design begins, the hazards must be found and the options for responding to the hazards must be considered. An opportunity and constraints map is the best tool for communicating these hazards. The process outlined below describes how to add consideration for new landscape hazards to an opportunity and constraints map. This process has been adapted from the NISI standards for producing drainage plans and opportunity and constraints mapping (Figure 6, CSA-S503-15 Community Drainage, 2014).

It may be necessary to obtain the services of CGS territorial headquarters staff, a consultant planner or engineer to complete these steps.

Step 4.1 Develop a baseline drainage map

Schedule: Collection of data should start in late autumn (preferably 8 months before spring melt)

The baseline map shows the natural drainage system as it exists before an area is developed. The map should include:

- Watershed boundary and drainage sub-basins
- Topography (min 1 m) and natural flow direction
- Effects of man-made interventions on flow (e.g., culverts and ditches, outlets)

The baseline drainage map may be added as a layer to the opportunity and constraints map.

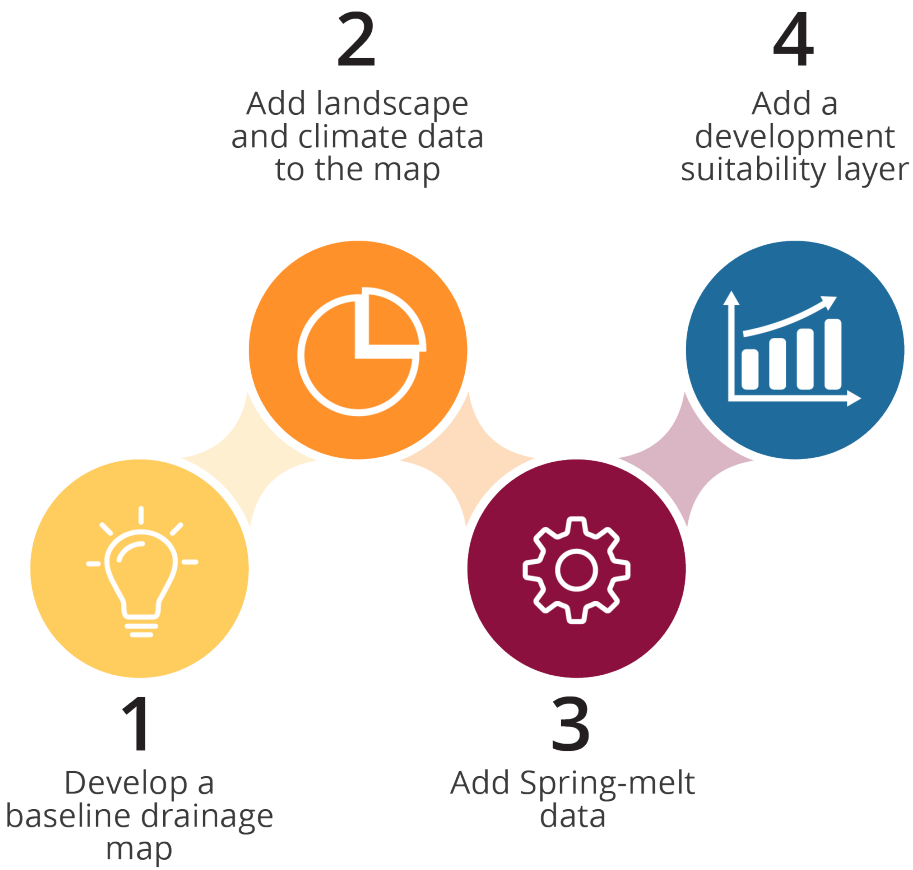

Figure 14: The four steps to add landscape hazards to an opportunity and constraints map

Step 4.2 Add landscape and climate data to the map

The following information should be gathered, where available, and considered when updating the opportunity and constraints map:

- Existing drainage
- Surficial geology
- Air photos, satellite images, land use maps
- Local knowledge (problem areas, climate change)
- Historical surface water levels
- Local permafrost conditions and areas where erosion, thaw subsidence, frost heaving and other permafrost thaw related issues have been observed
- Modelled / projected climate conditions

Schedule: To be completed prior to spring so that the areas of potential development can be observed during spring runoff

Refer to the Climate Atlas (www.climateatlas.ca), or contact the GN Climate Change Secretariat to see what climate studies and data are available.

Step 4.3 Add Spring-melt data to opportunity and constraints map

The drainage conditions are unique during Spring-melt because this is the time of the year when there is the most surface water flow on the land caused by melting snow and ice. The heavier water flow causes flooding and erosion risks which may damage infrastructure and cause other issues.

It is helpful to observe the Spring-melt and include any data collected in the opportunity and constraints map. The following Spring-melt data should be added to the map:

- Areas of water ponding
- Width and extent of drainage courses, streams lakes and ponds at peak levels
- Erosion activity areas
- Areas where subsidence or landsliding appears to be happening
- Locations of undersized or damaged culverts
- Locations where water flows over the roadside or trails

Schedule: Data collection should occur during summer months so water bodies and terrain can be observed and samples can be obtained.

"Ponding" describes surface water that has settled in an undesirable location. When water ponds it seeps into the ground over time. If it is allowed to seep into the soil it may cause local thaw subsidence and/or frost heaving. These changes may negatively impact nearby buildings and infrastructure.

Step 4.4 Add a development suitability layer to the opportunity and constraints map

A development suitability layer shows information about where development should occur, given all of the opportunities and constraints identified during the mapping process. The local terrain conditions are categorized based on how much information is known about them, and the hazards they pose to development. The development suitability layer may be added on top of the opportunity and constraints map. The layer may use the following categorization of development suitability:

- **Suitable for development:** Ground conditions known, permafrost stable if present, well drained soils, slopes <5°; existing information good
- **Possibly suitable for development:** Area generally suitable but requires field inspection and further study as some constraints/data gaps present
- **Marginally suitable for development:** All data indicates significant constraints present but may contain pockets of useable land subject to detailed study
- **Unsuitable for development:** Rugged terrain; presence of geohazards or subsidence indicating permafrost instability; floodplain.
- **Unknown suitability:** Data non-existent or unsuitable for terrain analysis to determine land development suitability (e.g. inadequate coverage, scale, accuracy etc.)

Schedule: Analysis can be undertaken immediately following the Spring-melt data collection.

STEP 5: ESTIMATE DEVELOPMENT COSTS

Prior to selecting a new development area, a preliminary cost analysis is needed to determine if development is economical. In cases where there are two or more areas under consideration, this step will help determine which area is most economical to develop.

By comparing the expected development costs, the advantages and disadvantages of each area will be clear. The cost analysis should incorporate rough estimates for on-site and off-site construction costs, as well as soft costs as shown in table 7.

Table 7: Types and examples of subdivision development costs

On-site hard costs	**Off-site hard costs**	**Soft costs**
Roads Drainage ditches and culverts Power poles and lines Piped water and sewer lines Parks / playgrounds Walking trails Signage and street lighting Gravel fill to address ponding	Upgrades/extensions to access roads Relocation of any existing facilities Construction of a new or upgraded water pumping or reheat station	Administration Interest payments on borrowed money Planning and engineering design services Legal survey Geo-technical survey Project management

STEP 6: CONSULT AND LEARN FROM THE COMMUNITY

The site selection information gathered during steps 1 through 5 should be summarized and presented to the municipal council and to the general public. Before making a decision about the location of a new subdivision, council may wish to seek input from the wider community at an open house or public meeting.

The information presented to the public and to council should highlight the strengths and weaknesses of each area under consideration so that they can understand the underlying issues. The meeting also provides a good opportunity to hear residents' observations about the development areas and how climate change is affecting those areas now or in the future. This discussion will allow council to make an informed decision about which area is best suited for development for homes and other community uses.

Although the views of the public should be carefully considered, the municipal council is responsible for deciding which areas should be developed. Council is responsible for analysing all aspects of the selection process and choosing the area that will best allow the community to develop in an orderly and efficient manner and at a price that is affordable to the community.

Once the municipal council approves the location of the subdivision, it issues a resolution so that work can begin on the conceptual subdivision design. This process is described in Part C: Subdivision Design Guidelines.

Figure 15: Public meeting with the community

Part C

SUBDIVISION DESIGN GUIDELINES

Introduction

Once the appropriate site for a subdivision has been selected, the conceptual subdivision design can begin. In many respects, it is helpful to think of subdivision design in terms of layers. The first layers to consider in the subdivision design process are the major development constraints, which determine the "no-build zones" within the subdivision site. Once all constraints have been identified and mapped, the remaining areas can be used as the main "build zones" of the subdivision site.

The purpose of comprehensive constraints mapping is to protect sensitive areas from development (cultural, social, environmental, etc.). By spending enough time mapping the major constraints at the beginning, problems can be avoided later in the subdivision design process. This exercise will ultimately focus development activity to appropriate locations within the subdivision.

A total of 37 guidelines grouped into 8 themes are provided in this part. The guidelines are intended to outline all the major design considerations in the process of subdivision design. The guidelines in the first four themes assist in **determining** the "build zone". The guidelines in the last four themes assist in **designing** the "build zone".

Since each site will have its own set of unique characteristics, not all guidelines will apply in each case. There may also be situations where some of the guidelines conflict or cannot be met due to special circumstances. As such, the guidelines are intended to help ensure all design options are explored and the best design solutions become clear. A hypothetical development area is presented throughout the chapter to illustrate the application of the guidelines.

GUIDELINES FOR DETERMINING THE BUILD ZONES

Integrate Community Consultation and Inuit Qaujimajatuqangit (IQ)

1. Consult with the community to obtain their input on the most important considerations for the design of the subdivision.
2. Integrate Inuit Qaujimajatuqangit (IQ) in all constraint mapping and land use decisions by ensuring the active participation of Inuit in decision making regarding subdivision design.
3. Integrate community knowledge of changes in the land such as slope or shoreline erosion as well as drainage issues into land hazard mapping. Use community knowledge to test any existing hazard mapping for accuracy.

Figure 16: A general development area for a new subdivision is identified as the hatched area

Figure 17: Gathering Inuit knowledge of a potential development site

Map and Adapt to Physical Features and Landforms

4. Map all of the lakes, streams, and major shorelines within the subdivision and reserve all land within 30.5 metres (100 feet) of all watercourses for open space. This includes the 100 foot strip referenced in the Nunavut Agreement.
5. If a geo-technical study has been undertaken for the site, map all lands with known terrain hazards (e.g. unstable soil conditions, ground displacement due to permafrost melt), and reserve these areas for open space or low-impact land uses such as parks.
6. If site observations or community monitoring has revealed concerns with water ponding or poor drainage in the development area, consider developing a drainage plan for the area to guide the subdivision design.
7. If site observations or community monitoring has revealed concerns with ground stability or slope erosion within the development area, consider undertaking a geo-technical study to guide the subdivision design.
8. Avoid areas of heavy snow accumulation that will be difficult to mitigate through design (see figure 18).
9. Using land contour information, map areas of the subdivision site that have slopes in excess of 15%. Generally avoid placing building lots and roads where the lands have slopes of 15% or more.
10. If the new subdivision is close to a current or former solid waste disposal site or a sewage lagoon, map the waste disposal site or sewage lagoon and identify the 450 metre setback line from the disposal area footprint in all directions. If a portion of the development area under consideration falls within the setback, the GN Environmental Health Officer (EHO) in the region may be consulted to determine any potential risks of developing in proximity to, or within, the 450 metre setback. The level of risk will depend on the land use proposed, as no residential or food preparation uses are allowed within the setback area.

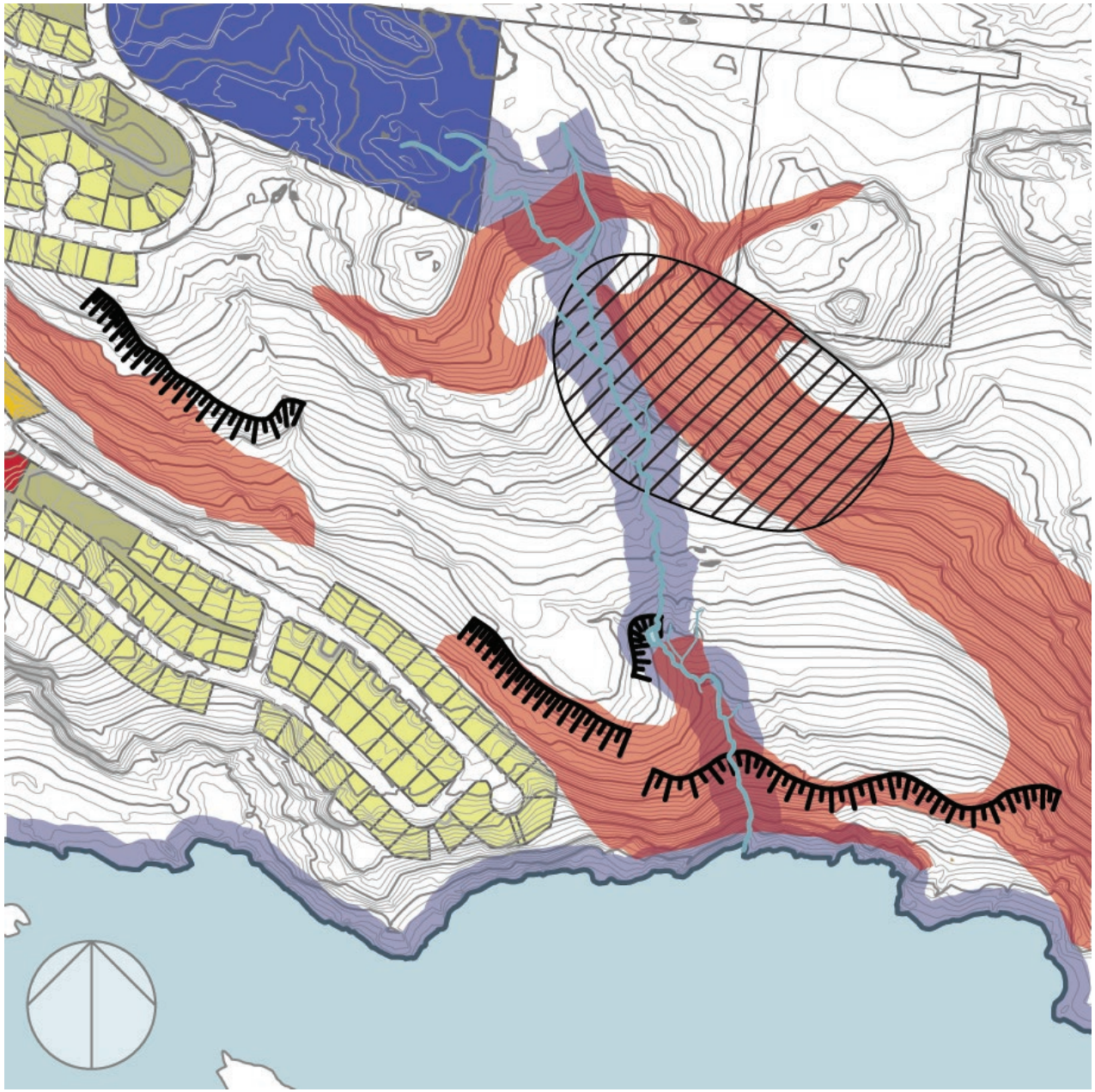

Figure 18: Site analysis responds to guidelines by identifying steep slopes greater than 15% (red), water body setbacks (light blue), snow drifting areas (black hatching), and significant rock outcrops (black).

Protect Environmentally Sensitive Areas / Features Valued by the Community

11. Identify and protect any additional natural and cultural heritage features such as berry picking areas, prominent views or access trails to the sea, wildlife corridors and archaeological sites. Review community consultation notes to determine what features are valued by the community.
12. Obtain all archaeological mapping for the area from the Territorial Archaeologist of the Government of Nunavut. Inform the Territorial Archaeologist that the municipality is initiating a process to design a subdivision. Archaeological information is sensitive and receiving this mapping may require an agreement of confidentiality.
13. Avoid locating any development within 30 metres of any known archaeological sites and consult the Nunavut Archaeological, Territorial Archaeologist and Paleontological Sites Regulations for further direction on any permits that may be required.
14. If evidence of a previously unknown archaeological site, paleontological site, or a fossil is discovered during the subdivision planning process, promptly report the findings to the Territorial Archaeologist.

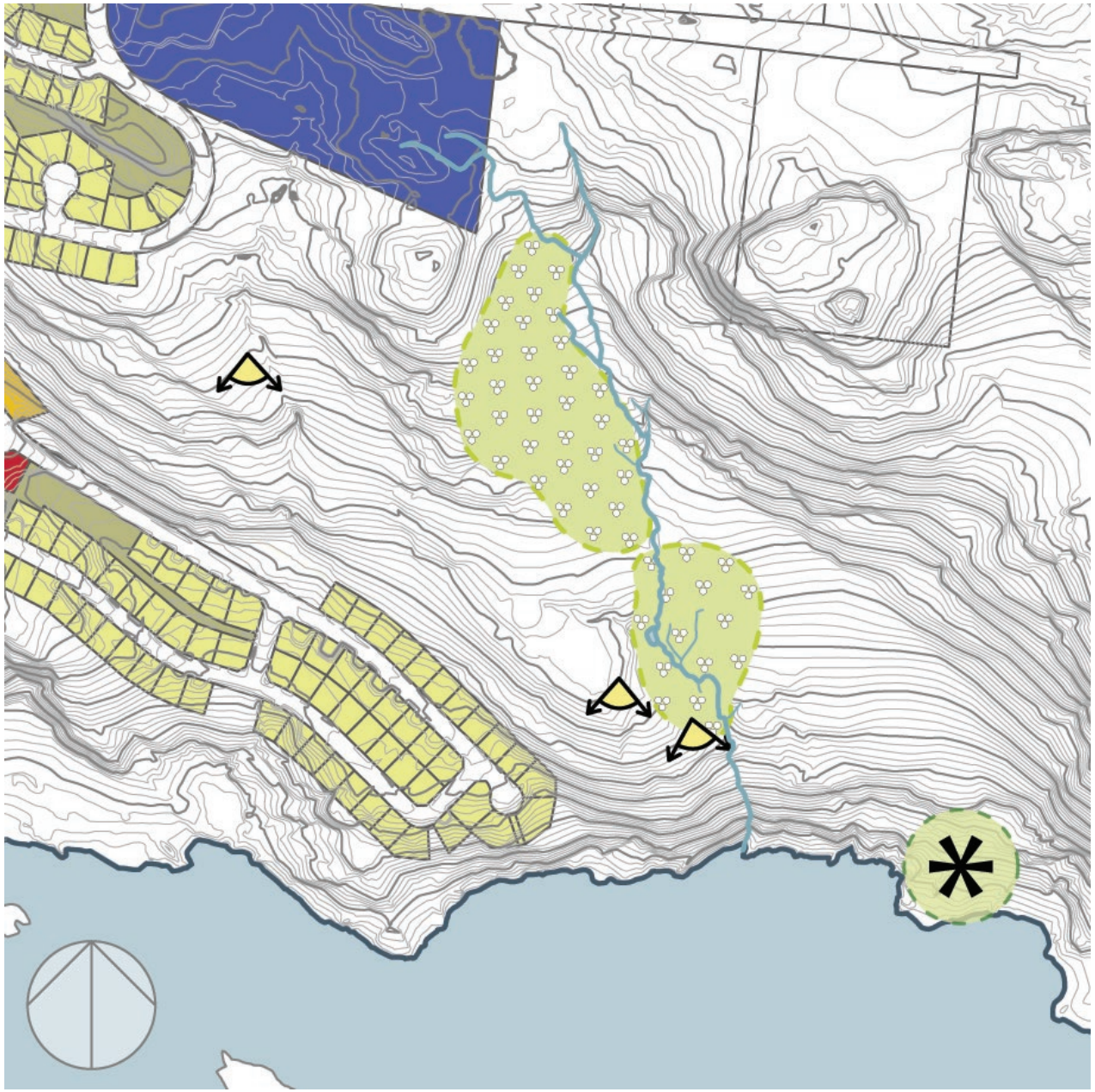

Figure 19: Site analysis identifies berry picking areas (green with berries), prominent views to the sea (triangular markers) , and archaeological feature (black star) with 30m development setback.

Consider Airport Proximity

15. Refer to the relevant Airport Zoning Regulations issued under the authority of the Federal Aeronautics Act. The regulations can be found at the Justice Laws Website (https://laws-lois.justice.gc.ca/). Note that some Airport Zoning Regulations are named according to obsolete community names (e.g. Spence Bay instead of Taloyoak).
16. Map any required setbacks or aircraft approach surfaces, particularly if the new subdivision is located within 4 kilometres of the airport or if the new subdivision is beneath any flight paths. Future buildings must not pierce the outer surface, transitional surfaces and approach surfaces that are described in the Airport Zoning Regulations and the Transport Canada publication Land Use in the Vicinity of Airports (TP1247).

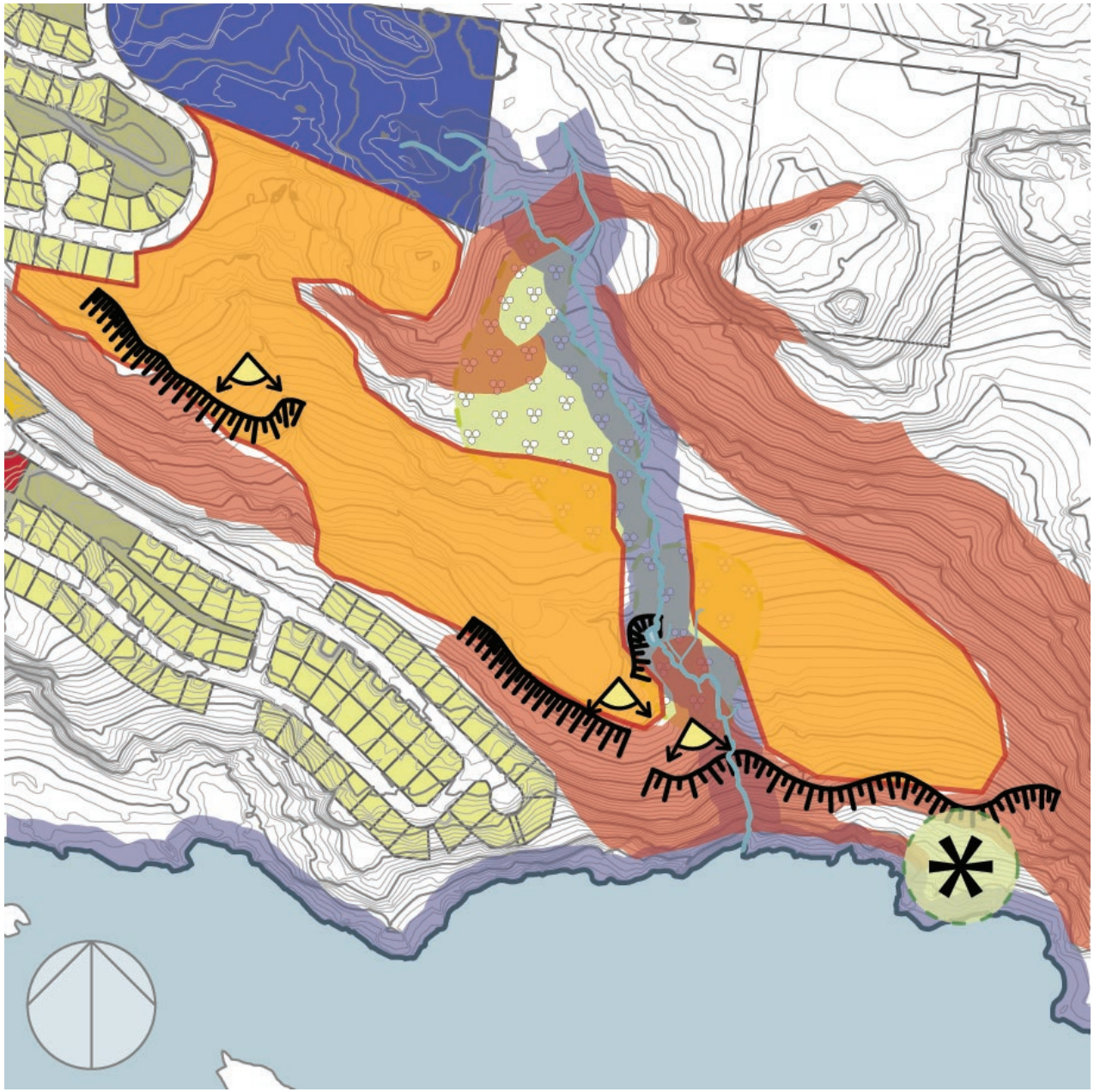

Figure 20: The analysis for guidelines 1 to 16 result in the identification of a "build zone" (shown in orange).

GUIDELINES FOR DESIGNING THE BUILD ZONES

Adapt the Road Network for Wind, Snowdrifting, Drainage and Solar Orientation

17. Identify areas of known or anticipated snowdrifting. If snowdrifting is a known problem in the development area, undertake a snowdrifting study to determine the best design responses such as road layout, areas to avoid for building, and potential snow fence locations.
18. Map the direction of the prevailing winds in the community, as well as any secondary wind directions (e.g. main direction of winds during storm events). A snowdrifting study will document the predominant wind pattern in the community. Typically the dominant wind patterns are northeast winds but can vary.
19. As much as the terrain allows, orient the major roads servicing the subdivision parallel to the major wind direction, and orient intersecting streets at right angles (90 degrees).
20. If the shape of the terrain does not allow for the best layout according to the prevailing wind direction, consider orienting roads parallel and perpendicular to the next most common wind direction.
21. Where heavy snow melts are expected, consider aligning roads in these areas perpendicular to the slope of the land to encourage proper drainage along the side of the road.
22. Consider orienting some roads in a general east-west direction (+/- 30 degrees) to maximize exposure of lots and buildings to sunlight (i.e. so that the front and rear of buildings, not their sides, face south).

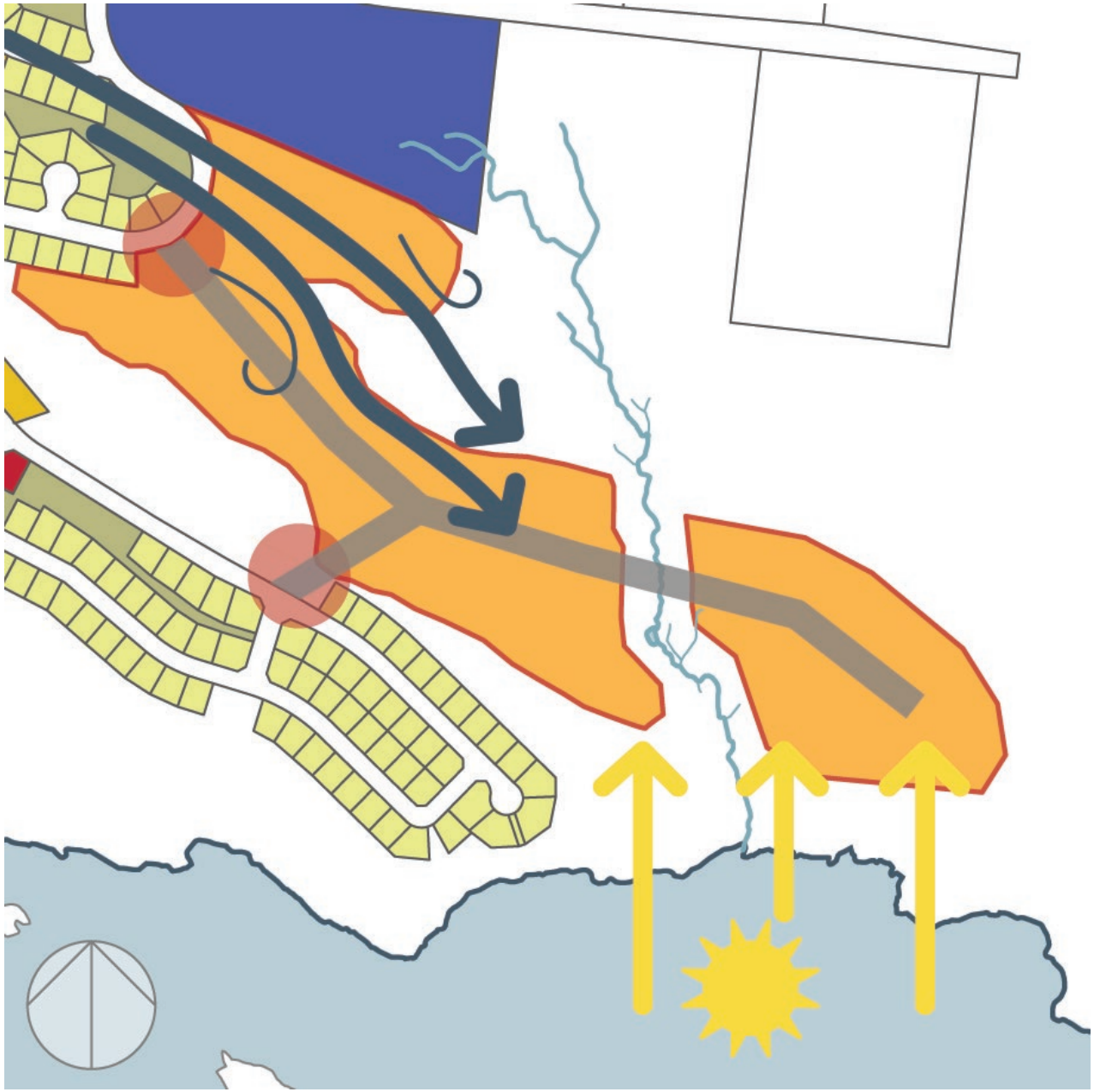

Figure 21: To determine a conceptual road layout, consideration must be given to prevailing wind direction (blue arrows) solar orientation (yellow arrows), and road access points (red dots) to the development area. The optimum conceptual road layout will need to balance these guidelines in addition to consideration for drainage.

23. Avoid the use of cul-de-sacs. Where they are the only design option, minimize their length.
24. Minimize the number of road crossings across major drainage corridors to avoid ice blocking and damming caused by crossings.

Integrate the Community and Strengthen Identity

25. In addition to roads, ensure the new subdivision can be well connected to the existing community by snowmobile and by walking trails.
26. Create an identifiable focal point to the subdivision that will contain a variety of uses, services and amenities. Generally locate any required new community facilities such as a school, library, community hall, recreation complex, church or park, along with local commercial uses around this focal point. Larger buildings and their parking areas require larger areas of flat land. In development areas with steep slopes, reserve flat land for larger buildings.
27. Identify any connection points that could be designed as “gateways” to the subdivision. Gateways can be defined by the larger buildings or community use buildings.
28. Identify road access points to the new subdivision. Ensure a minimum of two road connections to ensure security of access for emergency services.

Consider Land Use and Density

29. Ensure that the type and amount of land uses reflect the assessment of land needed for new lots (as calculated in Part B Step 1 of Selecting a Development Area).
30. Consider the need to use land efficiently to reduce overall development costs.
31. Consider appropriate separation and/or physical buffers between existing and proposed land uses that generate noise or heavy vehicle traffic (e.g. basketball court, recreation centre).
32. Increase residential density at appropriate locations, such as near community facilities, parks and commercial uses, and where access to a beach front or views will not be blocked.
33. Community facilities that are more industrial in nature or not appropriate next to residential areas, such as a fish plant, hamlet garage or maintenance facilities, should be located in an industrial subdivision.
34. Identify appropriate sites for playgrounds and playing fields within the subdivision. Where possible integrate park spaces with other open spaces that may otherwise be constrained for development (e.g. a watercourse setback). Try to ensure all residences are within 300-500 metres of a playground.
35. Identify general locations for special utility buildings or structures if required to service the subdivision. For communities on piped services, this might include a water booster station or sewage lift station. Typically these types of infrastructure are permitted in any land use or zone.
36. Identify locations for snow piling where the piling will not interfere with drainage and not cause drifts on adjacent roads or lots.

Consult the Community

37. If there are multiple subdivision design concepts, get feedback from the community about which design best meets community needs and values. The best design might be a combination of elements from more than one concept.

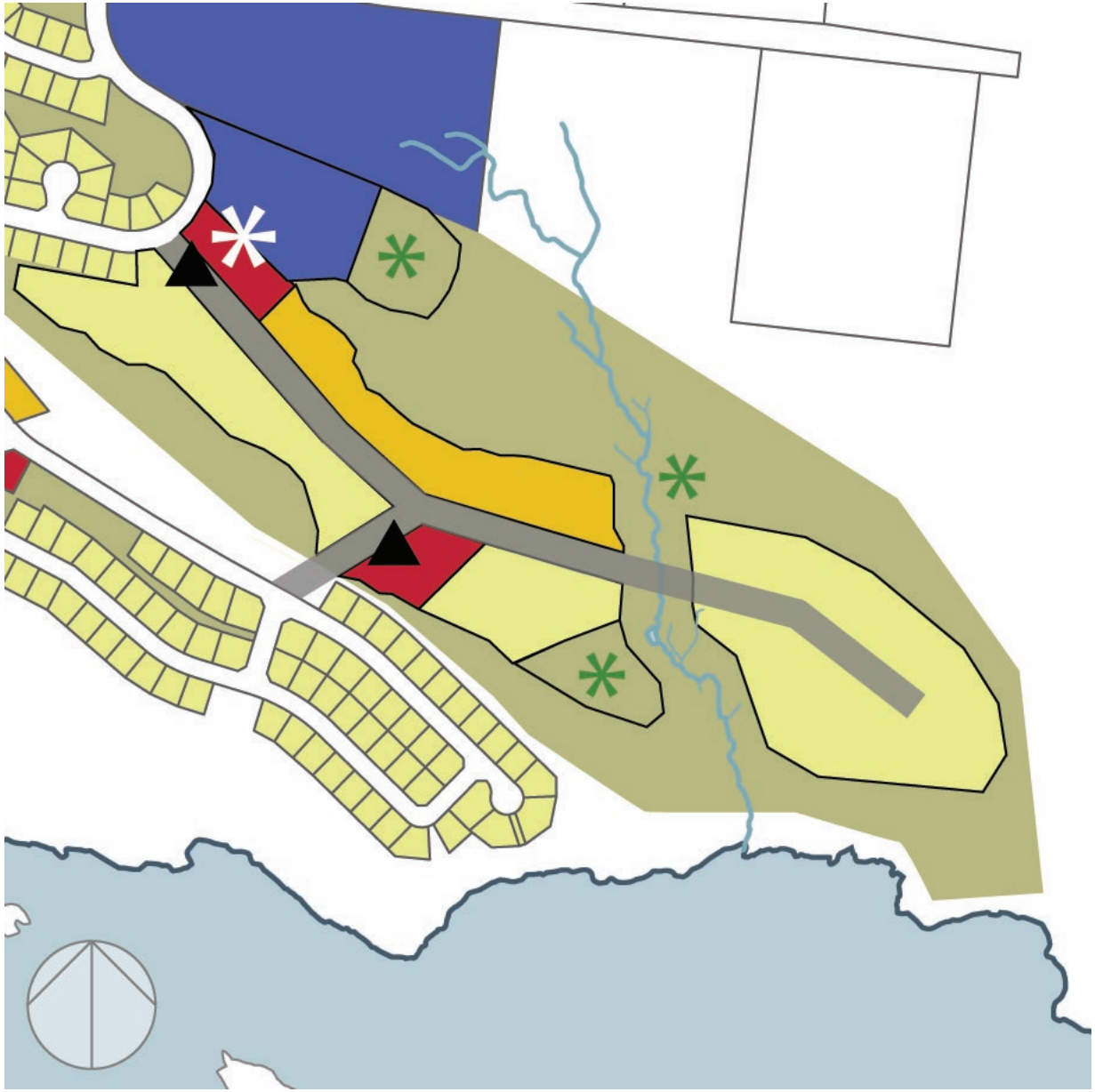

Figure 22: Proposed land uses should consider a community focal point (white star), gateways to the subdivision (black triangles), adjacent land uses, location of parks (green stars), and density of development (e.g. light yellow represents low density residential development; orange represents medium density; red represents high density).

Part D

SUBDIVISION STANDARDS

Introduction

This part of the manual provides guidance and typical standards for the layout and lotting of new subdivisions. The standards focus on the keystone issues of road design and subdivision lotting standards, supported by other useful information such as utilities and trail design. The following standards for subdivision design are not meant to replace sound planning and engineering judgment and design. A qualified planner and engineer should be involved in the review of any new subdivision design.

To illustrate the concepts and standards described in this section of the manual, a hypothetical portion of a new subdivision has been created in plan view. Throughout this text, specific elements of the subdivision are highlighted using different colours, and by zooming in to provide close-up views. The plan view drawings are supported by a number of cross-sections and other illustrations to clarify key points.

STANDARDS FOR ROAD DESIGN

The design of roads and how they connect to each other is an important element of subdivision design. A well-designed road network will function properly while promoting safety of vehicle and pedestrian movement. Nunavut communities typically have two classes of roads. Collector roads are the main spine roads through the community that carry the largest volumes of vehicle and pedestrian traffic. These roads often connect major community and commercial uses such as municipal and territorial offices, a recreation centre, community hall, or retail store. Local roads form the second classification and carry smaller volumes of traffic. Local roads connect to collector roads and provide access primarily to residential lots and open spaces. Local roads may also provide access to small-scale commercial and community uses.

Road design considers more than just the traveled road surface, it also considers utilities such as power poles, telephone lines, access vaults and utilidor lines (in the case of piped services), pedestrian walkways, or other such infrastructure. Road allowance width and geometry therefore need to accommodate this infrastructure. Several of the guidelines described in Part C (e.g. driveway separations and trail design) are also represented in the illustrations.

Figure 23: This hypothetical portion of a subdivision will be used to illustrate the concepts described throughout this part of this manual. Portions of this design will be highlighted with colour and zoom-ins throughout this part.

Width of road rights of way

1. The minimum width of the road right of way for communities on trucked services should be as follows:
    a. Collector Road - 18m
    b. Collector Road where no lots front onto the road - 16m
    c. Local Road - 16m
    d. Local Road, one-way - 13m

2. The minimum width of the road right of way for communities on piped services should be as follows:
    a. Collector Road - 22m
    b. Local Road - 20m
    c. Local Road, one-way - 15m

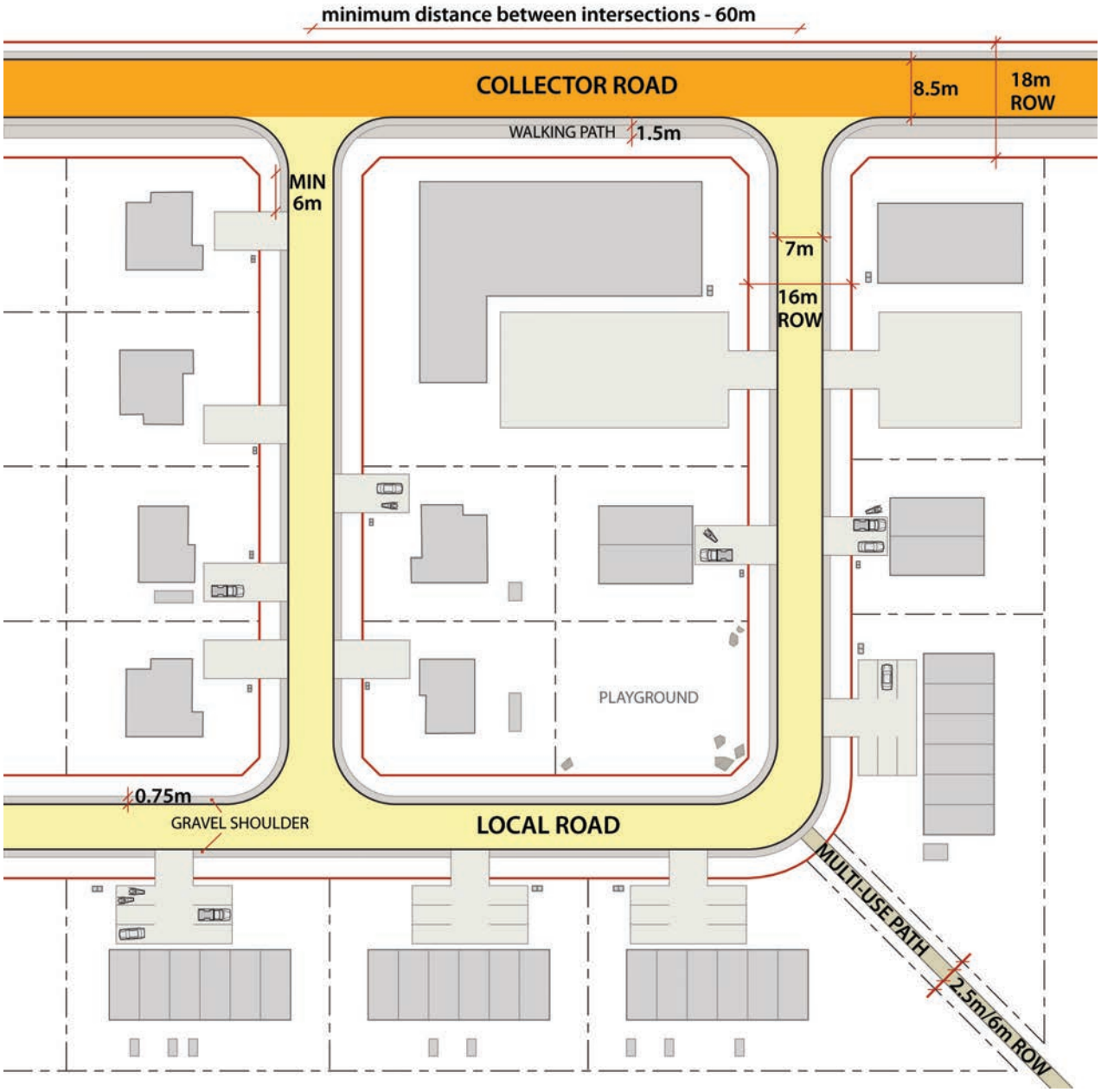

Figure 24: Minimum widths for the rights of way and the traveled road surfaces are illustrated for collector (orange) and local (yellow) roads within a subdivision on trucked services.

Width of traveled road surface

3. The minimum width of the traveled surface of the road shall be as follows:
    a. Collector Road - 8.5m
    b. Local Road - 7m
    c. Local Road, one-way - 4m

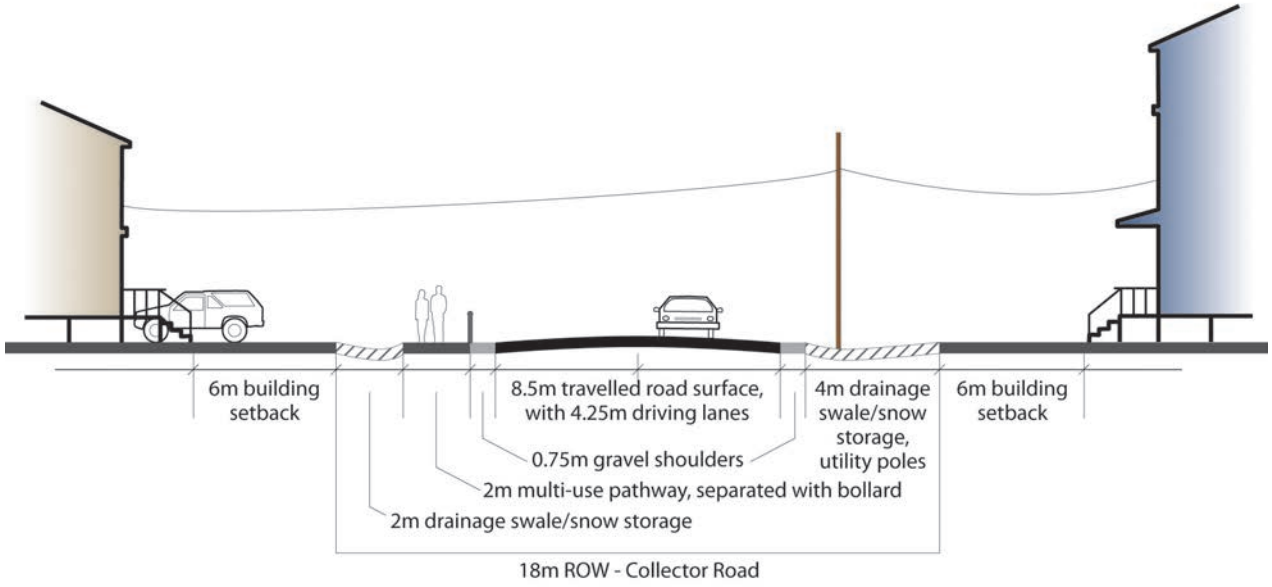

Figure 25: Collector road rights of way on trucked service should be at least 18 metres wide to allow for road lanes, shoulders, pedestrian walkways, drainage ditches and utility poles.

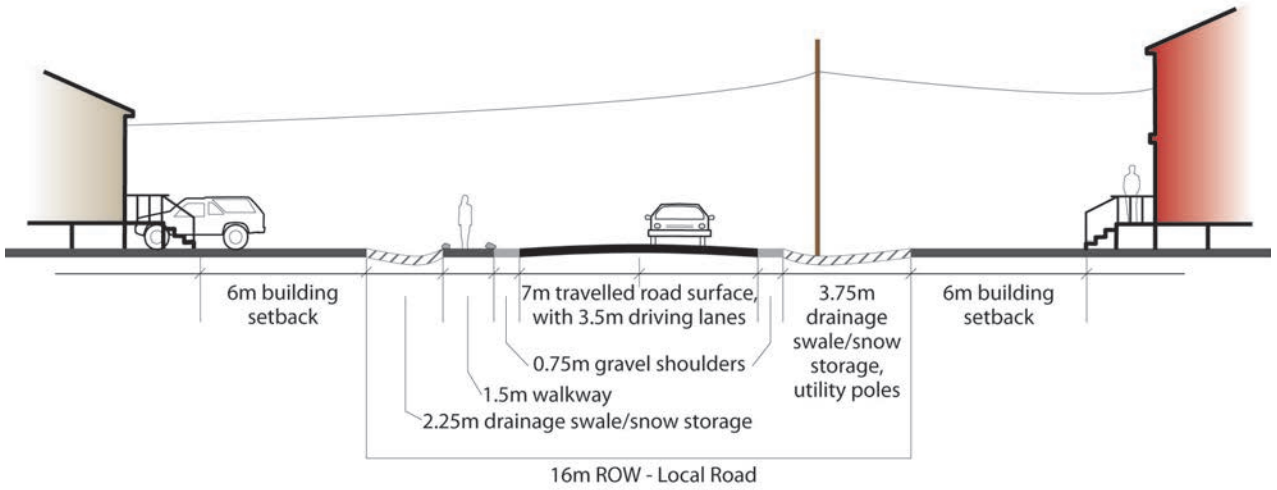

Figure 26: Local road (two-way) rights of way on trucked service should be at least 16 metres wide to accommodate road lanes, shoulders drainage ditches and utility poles

Gravel shoulders

4. The roadbed should have a minimum shoulder width of 0.75m. However, any shoulder intended as a pedestrian walkway should have an additional width of 1.5m, for a total of 2.25m.

Slope of roads

5. Roads should be designed to have a maximum slope of 8% wherever possible.

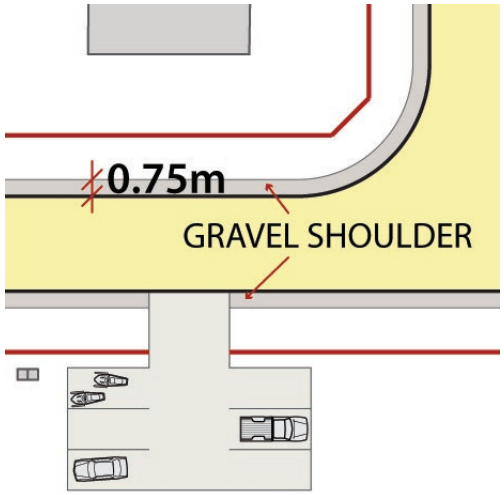

Figure 27: Gravel shoulders of at least 0.75 metres width should be incorporated into all local and collector road designs.

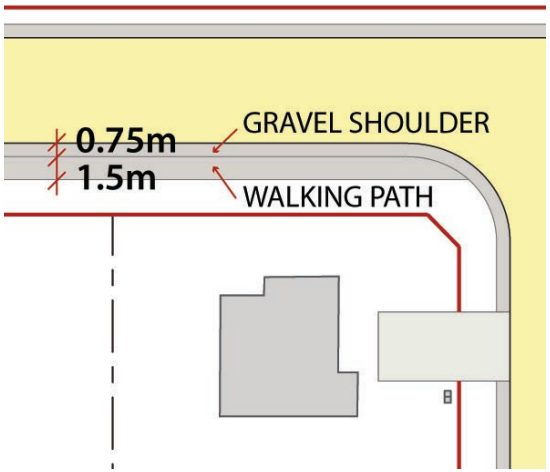

Figure 28: Dedicated walking paths located within road rights-of-way should be at least 1.5 metres wide, plus the width of the gravel shoulder, for a total of 2.25 metres. Vertical barriers (e.g. bollards or boulders) can be placed in the shoulder to protect pedestrians from vehicle traffic.

Figure 29: Pathways can be located within road rights-of-way. Elements such as bollards and boulders have been used to separate the pathway from vehicle lanes.

Figure 30: The recommended maximum road slope of 8% is illustrated above. A road with an 8% slope will rise vertically by 1 metre for every 12.5 metres of horizontal distance.

Intersections

6. To promote safety, roads should meet each other at perpendicular angles (i.e. 90°), wherever possible. Where it is not possible to achieve perpendicular road intersections, the minimum design angle between the roads that creates the intersection shall be 70°. One solution to a road intersecting another at an angle is to straighten the angled portion to 90° a minimum distance of 40 metres from the centre of the intersection.
7. Intersection design shall incorporate "splays" to accommodate servicing infrastructure. For corner lots, a splay is created by measuring 5 metres back from the corner along both lot lines and then drawing a line between these two points. This cuts a triangular piece of land off the corner of the lot, and this piece becomes part of the road right of way.
8. The minimum spacing between intersections shall be 60 metres, as measured from the center of each intersection.

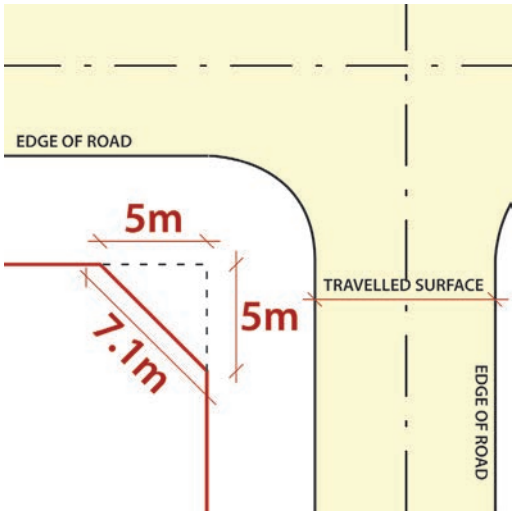

Figure 31: A "splay" of at least 5m in length must be incorporated for corner lots.

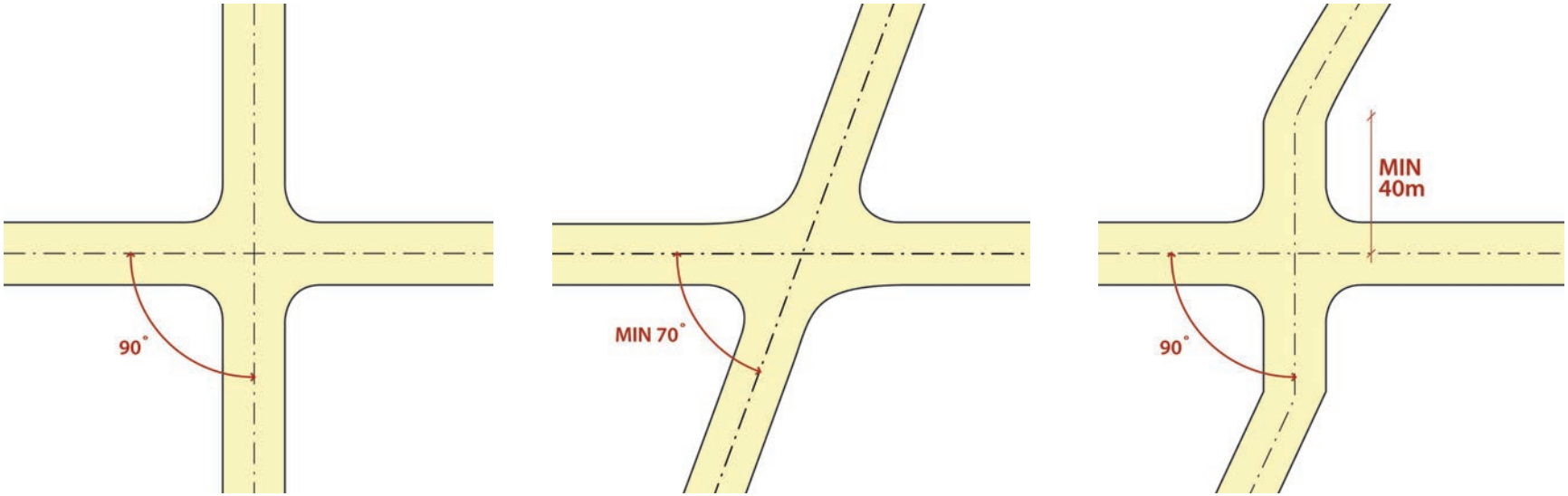

Figure 32: Roads meeting at an intersection should ideally meet at perpendicular angles (i.e. 90°). The minimum angle of intersection is 70° in cases where a perpendicular intersection is not possible. One solution to a road intersecting another at an angle is to straighten the angled portion to 90° at least 40 metres from the centre of the intersection.

Cul-de-sacs

9. The maximum length for any road ending in a cul-de-sac is generally 120 metres, as measured from the center line of the intersecting street to the centre of the bulb. A cul-de-sac in excess of 120m should contain a minimum 6m wide lane connecting to an adjacent street to allow for emergency vehicle access.

10. The minimum radius of a cul-de-sac bulb is 13.5 metres, as measured from the centre of the bulb to the road allowance. The minimum road surface radius in the bulb is 9 metres.

Driveways

11. Driveways of individual lots that connect to the traveled road surface shall be no closer than 6 metres to any intersection or intersection turning radius, wherever possible.

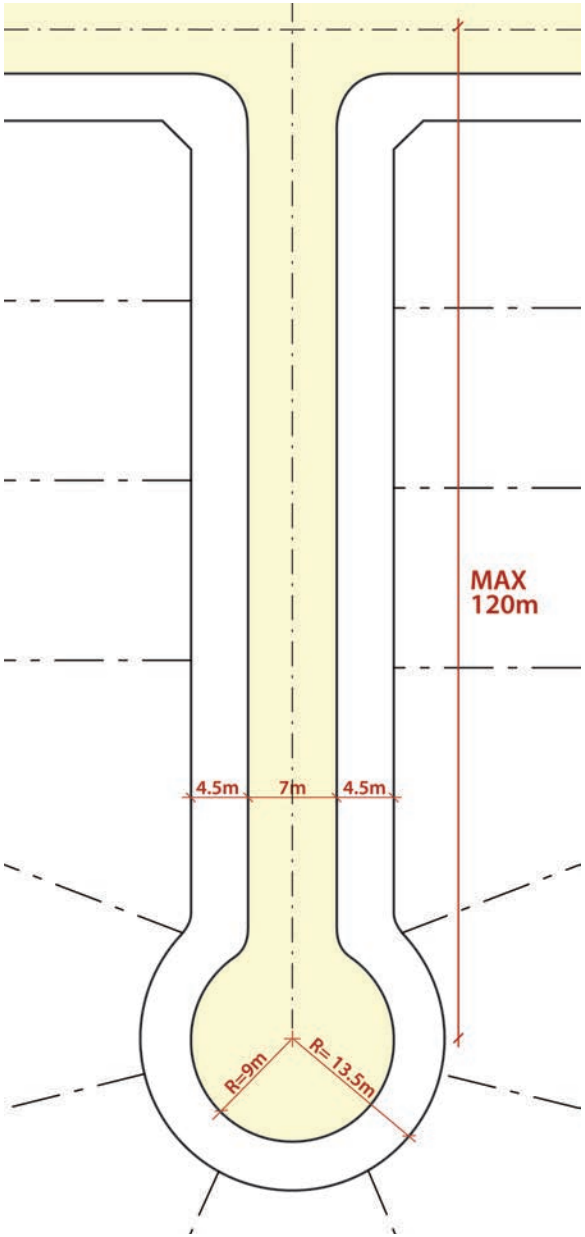

Figure 33: Cul-de-sacs on local roads should have a minimum right-of-way radius of 13.5 metres and a minimum road surface radius of 9 metres. The maximum length of a road ending in a cul-de-sac is 120 metres.

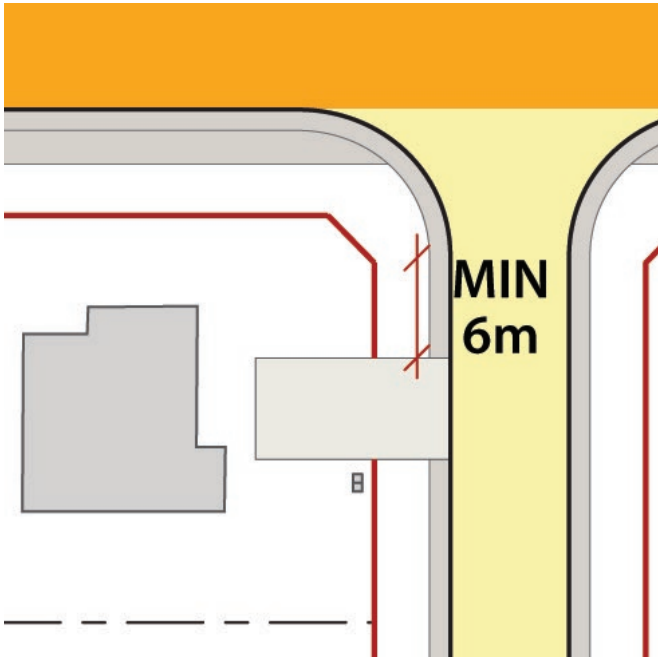

Figure 34: Driveways should be located a minimum of 6 metres from intersections and turning radii.

STANDARDS FOR TRAIL DESIGN

Getting around within a community does not always require a car or truck. Many people walk, or ride smaller vehicles such as ATVs, snow machines and even bicycles. While it is possible for each of these modes of transportation to be accommodated in the road, there can be some safety conflicts between different road users. Creating dedicated trails outside of the road allowance for pedestrians, ATVs and snow machines can help to reduce the conflicts between users. Properly designed trails can improve the safety and convenience of getting around town, and improve access to the sea and the land. Trails may cross roads, therefore special attention must be given to installing signage at crossing for both road and trail users.

The following standards specify how trails should be designed for safety and functionality.

Trail rights of way

12. The minimum width of a trail right of way shall be 6m for a trail leading into a subdivision. Trail rights of way may be combined with drainage or piped services easements as appropriate.

Trail surface design

13. A formal walking trail (i.e. laid with gravel) should have a minimum width of 1.5m. Steep sections of walking trails should incorporate stairs into the design.
14. Multi-use trails should have a minimum width of 2.5m.
15. Where trails cross drainage swales, ditches or natural drainage courses, footbridges and/or culverts shall be designed within the guidelines regarding drainage and culverts.
16. Where trails cross a road with a ditch depth greater than 1m, a snowmobile/ATV crossing should be added.

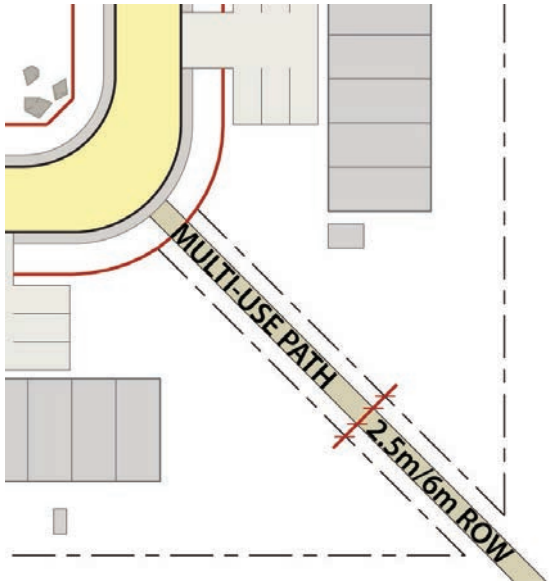

Figure 35: Multi-use trails (e.g. pedestrian, snow machine, ATV) should be a minimum of 2.5 metres in width and be located within a minimum 6.0 metre right-of-way. Drainage ditches can be incorporated into the rights-of-way for multi-use trails; however the right-of-way may need to be widened.

Figure 36: Properly installed culverts and footbridges ensure adequate drainage through the subdivision.

Figure 37: Small rocks can be used to accentuate the edges of walking trails. In steeper trail sections, it may be appropriate to build stairs to enhance the walking experience and prevent erosion.

STANDARDS FOR DRAINAGE

NISI Standards

Refer to "Community drainage system planning, design, and maintenance in northern communities" for additional standards

During the spring melt, large volumes of water begin to run off the land. Provisions for drainage must therefore be considered in the context of any subdivision design. Roads and gravel building pads typically act as barriers to the flow of water; however when placed in suitable locations in conjunction with culverts and ditches, roads and gravel building pads can be used to appropriately channel water flows. However, without the proper installation and maintenance of culverts and ditches, drainage paths can become blocked, which creates pools of stagnant water. These pools of water pose potential health and safety issues (e.g. child drowning). Culverts should be monitored by the municipality to ensure their continued functionality. Drainage works should always be appropriately sized to ensure that they can adequately accommodate the volumes of water that are expected to flow through each portion of the subdivision. This section specifies minimum standards for typical drainage works within subdivisions in an Arctic environment.

Ditches

17. The minimum slope of a drainage ditch shall be 0.5%, unless otherwise approved by the Municipal Planning Engineer or municipality.

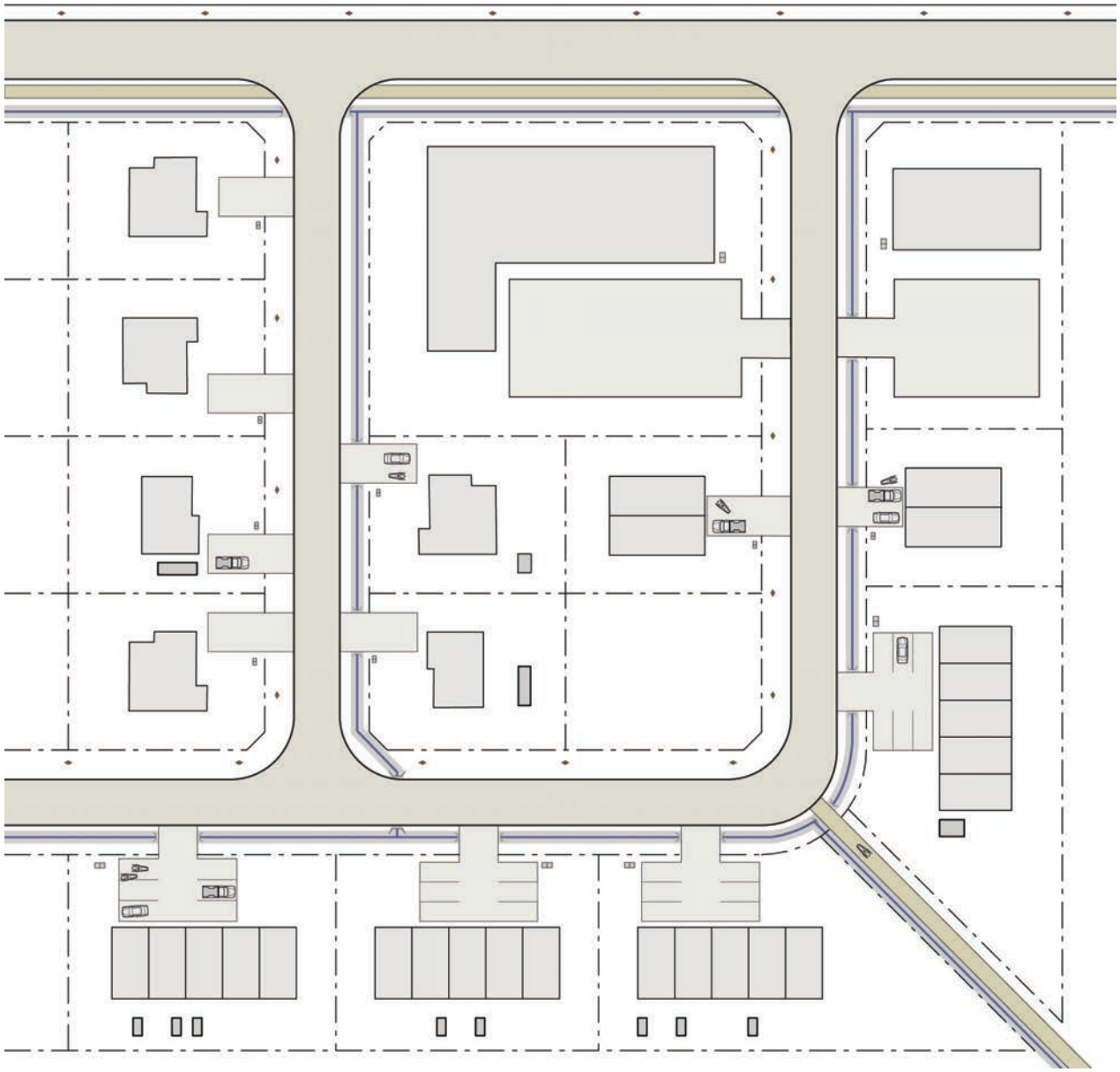

Figure 38: Ditches and culverts should be located within road rights-of-way and be properly maintained to avoid flooding and stagnant pools of water.

Culverts

18. The minimum diameter of a culvert shall be sized based on engineering best practices in Nunavut, as follows:
    a. Roadways = 450mm
    b. Residential Driveway = 300mm
    c. Non-Residential Driveway = 450mm
    d. Trails and Walkways = 400mm

19. The minimum amount of gravel cover on top of the culvert to protect against traffic loading shall be 300mm, as measured from the finished shoulder grade to the top of the culvert.

20. The minimum slope of a culvert shall be 0.5%, unless otherwise approved by the Municipal Planning Engineer or municipality.

21. The maximum length of a culvert across an access driveway shall be 12 metres.

Standard 18 is based on the NISI Community Drainage standards which require at least 450mm culvert width for roadways. This should be understood as a minimum, and the drainage needs in each community should be considered on a case-by-case basis. In Iqaluit, for example, it has been determined that a minimum of 600mm culvert width is needed for non-residential driveways.

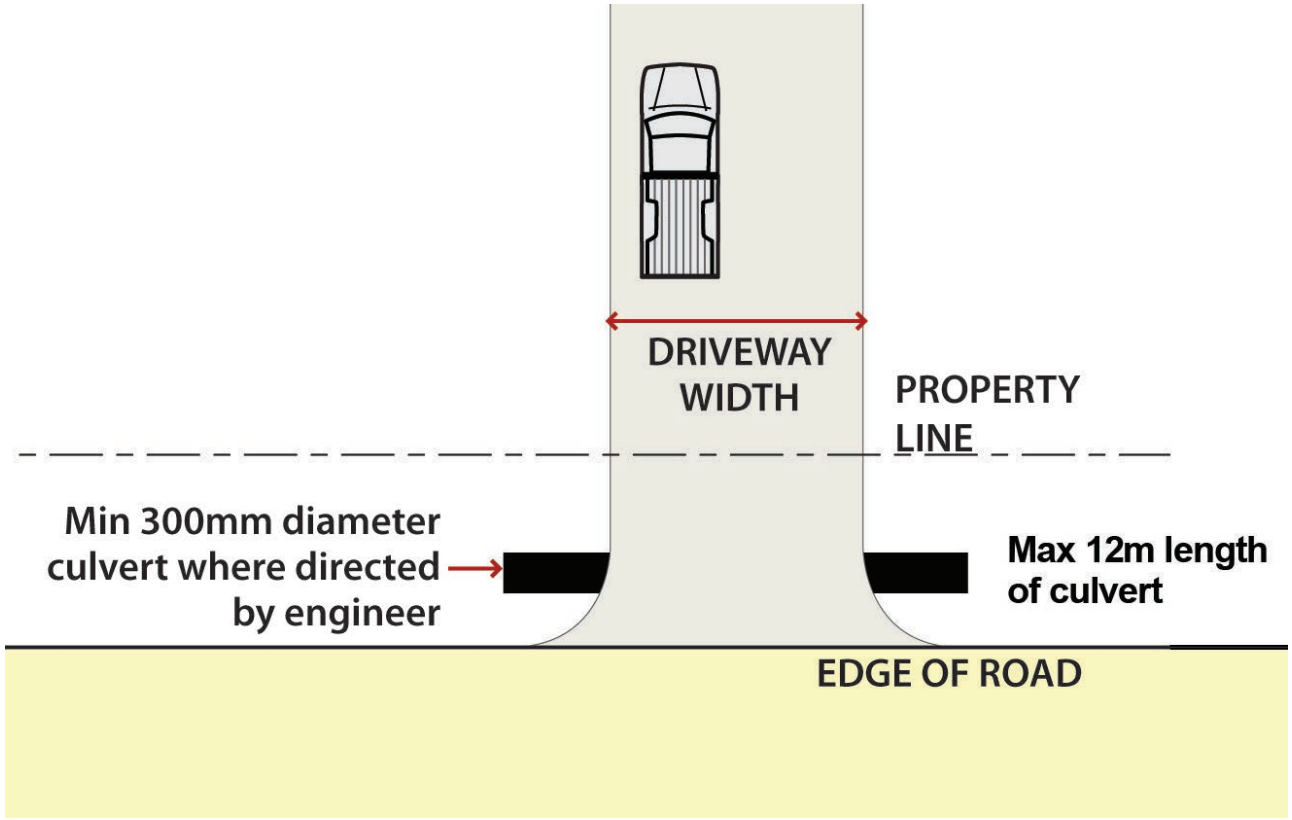

Figure 39: Culverts should be installed under driveways in line with any ditches in the road right-of-way according to engineering specifications.

STANDARDS FOR RESIDENTIAL LOTS

This section of the manual provides standards regarding the location and size of lots for residential development. It is generally desirable to locate residential lots on local roads instead of collector roads. Vehicles on residential lots typically back-out of the driveway onto the road so there is less potential for accidents on local roads which carry less traffic. Higher density residential development such as an apartment building can be located on collector roads. These developments generally have a parking area on the lot and a driveway where vehicles can safely pull in and out.

The size of residential lots is dependent largely on the type of units that are proposed for the lots. In general, lot sizes increase as the number of units increases (e.g. a 5-plex lot should be larger than a lot for a single-detached house). It is important therefore to have a good understanding of the types of housing that are anticipated to be built in the community over the lifetime of the subdivision. This could be based on the current trends in housing form; however, since the Nunavut Housing Corporation is involved in a large proportion of housing development, it is recommended that they be consulted to determine their build program for the community. For example, over the past several of years, the NHC's build program has primary included 5-unit row dwellings and 10-plexes.

Many municipalities in Canada don't allow buildings to be built across lot lines (unless the lot has been subdivided along a party wall). In Nunavut, however, it is common practice for a large residential building to span multiple lots. This is acceptable because most zoning by-laws in Nunavut define a lot as a leased area. In cases where a single lease covers multiple lots, these lots can be treated as a single lot.

Other considerations regarding lot sizes include topography, construction costs, Community Plan policies and Zoning regulations, soil conditions, fire separation requirements, and the type of services (lots with trucked services typically require more space to accommodate storage tanks and service connections). In Nunavut, it is also important to balance the needs of large families, as well as the desire of many households, particularly those active in traditional activities and the land-based economy, to store equipment in a shed or sea container on the lot. There may also be a variety of vehicles that are kept on the lot (e.g. qamotiq, snow machine, ATV, truck).

Location of residential lots

22. Low and medium density residential development (i.e. single-detached, duplex, row dwellings) should be located on local roads, where possible.

23. High density residential development (i.e. apartment building) should be located on or with close access to a collector road, where possible.

Size of residential lots

24. The recommended minimum size of a residential lot for trucked and piped services are provided in Table 8. Exceptions may be made to lot sizes to accommodate a specific form of development or to provide a range of lot size options.

Table 8: Recommended minimum dimensions for residential lots on trucked and piped services

	TRUCKED SERVICES		**PIPED SERVICES**	
Unit Type	Recommended minimum lot dimensions (width x depth = area)	Net Density	Recommended minimum lot dimensions (width x depth = area)	Net Density
Single detached	25m x 30m = 750 m^2	13 u/ha	18m x 30m = 540 m^2	19 u/ha
Semi-detached (same lot)	30m x 30m = 900 m^2	22 u/ha	20m x 30m = 600 m^2	33 u/ha
Row dwelling (e.g. 5-plex)	53m x 30m = 1,590 m^2	31 u/ha	30m x 30m = 900 m^2	55 u/ha
Stacked row dwellings (e.g. 10-plex)	55m x 30m = 1,650 m^2	60 u/ha	35m x 30m = 1,050 m^2	95 u/ha

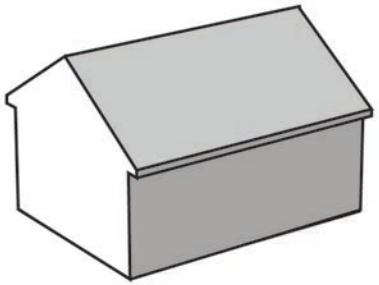

Figure 40: Single-detached

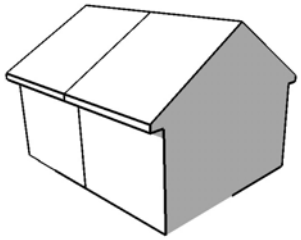

Figure 41: Semi-Detached

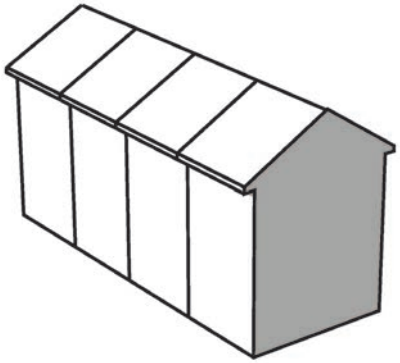

Figure 42: Row Housing

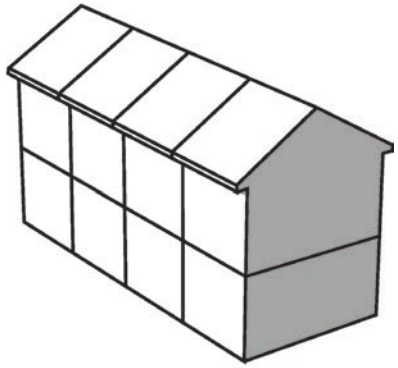

Figure 43: Stacked Row Housing

Calculating Density

Density is typically calculated and expressed in terms of the number of dwelling units per net hectare of development land (1 hectare = 10,000 m^2). The illustration contains two lots on trucked services – Parcel A and Parcel B – containing a 5-unit row dwelling and a semi-detached dwelling respectively.

Parcel A - Row dwelling (5 units)
Net area = 53 m (width) x 30 m (depth) = 1,590 m^2
Net density = 5 units / 0.1590 ha = 31.4 units/hectare

Parcel B - Semi-detached dwelling (2 units)
Net area = 30 m (width) x 30 m (depth) = 900 m^2
Net density = 2 units / 0.0900 ha = 22.2 units/hectare

To calculate the density over Parcels A and B (or a larger area, as appropriate) add the number of units on each lot and the areas of each lot. Then calculate density by dividing the number of units by the total development area as follows:

Units = 5 + 2 = 7 units
Net area = 1,590 m^2 + 900 m^2 = 2,490 m^2
Net density = 7 units / 0.2490 hectares = 28.1 units/hectare

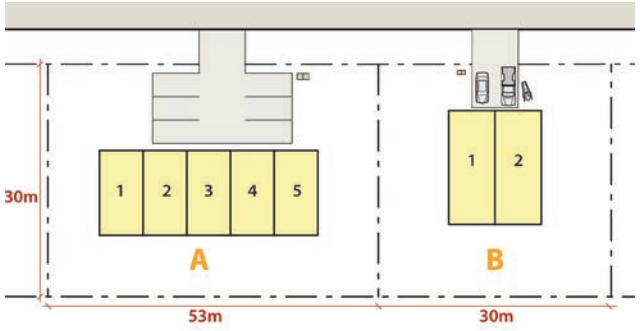

Figure 44: Density is calculated for two lots of varying sizes based on the number of dwelling units they contain

STANDARDS FOR NON-RESIDENTIAL LOTS

This section of the manual provides standards regarding the location and size of lots for non-residential development which includes community uses, commercial uses, and industrial uses. It is generally desirable to locate lots intended for community and commercial uses along collector roads instead of local roads since they tend to generate a fair amount of traffic. Exceptions to this rule may be to include small-scale community or commercial uses such as a craft shop or studio. Community and commercial use lots are relatively large lots that can accommodate a parking area on the lot and a driveway where vehicles can safely pull in and out onto the road. Industrial lots should generally only be located in subdivisions specifically dedicated for industrial uses and preferably with direct access to a local road.

The size of community, commercial, and industrial lots will vary significantly according to the intended use, but generally speaking tend to be larger than residential lots to accommodate larger buildings, parking areas, drive aisles, and amenity areas. The analysis of land needs for the subdivision (see Part B Step 1) will provide good direction for the sizing of lots. It is likely that not all uses will be confirmed or known so it is important to provide a range of lot sizes to provide choice.

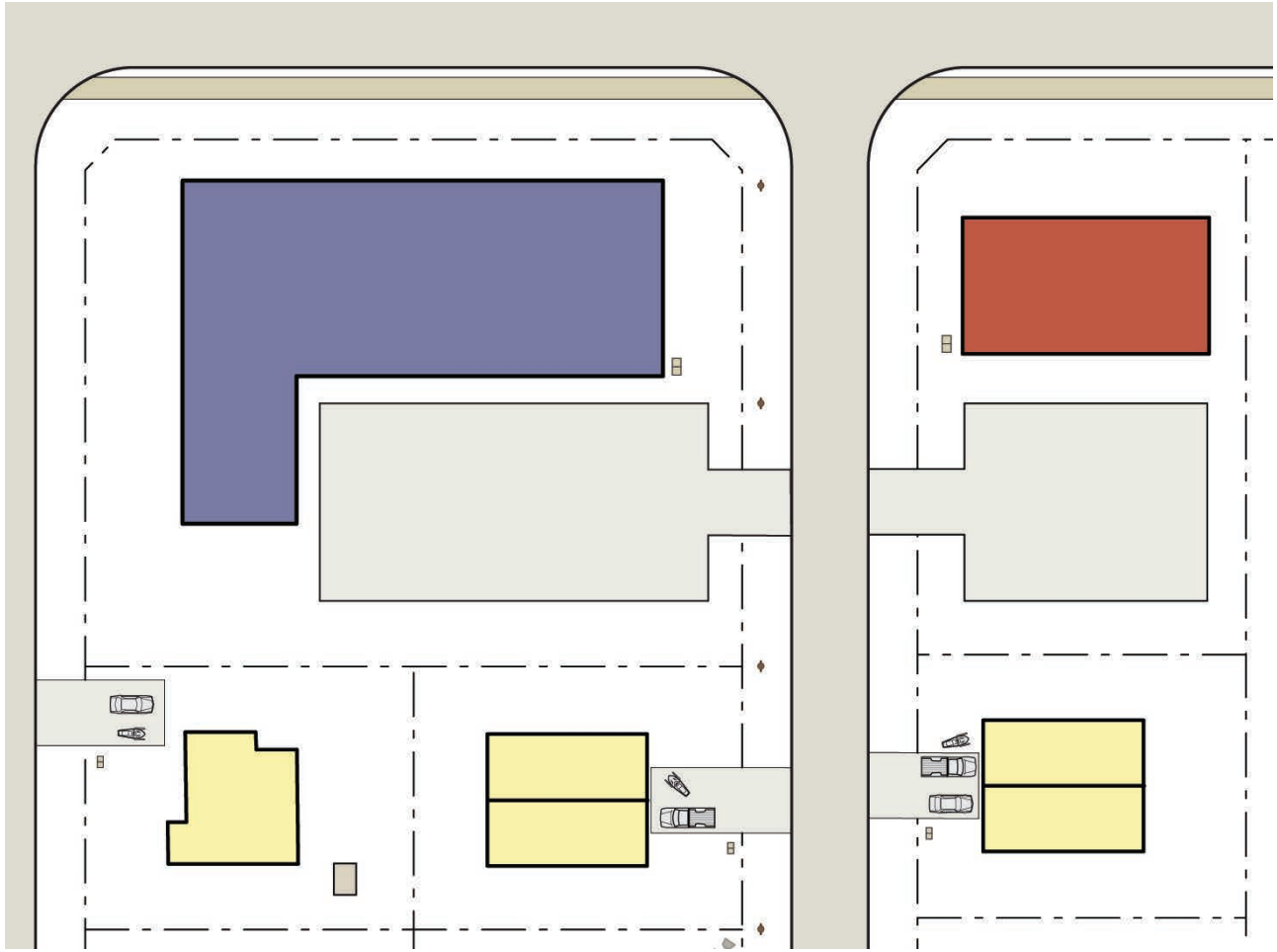

Figure 45: Major commercial uses (red building) and community uses (blue building) should face collector roads and preferably have vehicle parking located in the side and rear yards.

Location of non-residential lots

25. Commercial and community lots should be located on collector roads, where possible.
26. Small commercial and community lots intended for small-scale uses that will not generate excessive vehicular activity may be located on local roads.
27. Industrial lots should be located in industrial subdivisions with access to a local road. Where access to a local road is not possible, the number of lots fronting directly on a collector road should be minimized.

Size of non-residential lots

28. The minimum lot size for any commercial or community use is 25m x 30m, or a lot area of 750m^2.
29. The minimum lot size for industrial use is 40m x 40m, or a lot area of 1,600 m^2.
30. Where the size of a future building is known, the lot should be sized to accommodate the building footprint, building setbacks, the required parking, drive aisles, loading space, outdoor storage areas (typically only for industrial uses), accessory buildings, and amenity areas.
31. Where a use is anticipated but the size of the future building is unknown, lot sizing should be in accordance with Table 9, unless there are special circumstances.

Table 9: Typical land requirement for various community uses

Facility	Land Requirement
Elementary School	1 hectare
High School	1.5 – 2 hectares
Community Learning Centre or Hamlet Office	1,000 – 2,500 m^2
Health Centre	4,000 – 7,500 m^2
Community Hall	1,000 – 2,500 m^2
Hockey Arena	3,000 – 5,000 m^2

STANDARDS FOR OPEN SPACES, PARKS AND PEDESTRIAN CONNECTIONS

Open spaces serve a variety of functions within a subdivision including playing fields, playgrounds, and public gathering spots. The requirement for open spaces within a subdivision will be determined by the type and scale of facilities that are desired. It is also important to consider pedestrian movement in the design of any subdivision through the use of open spaces and mid-block connections as required. Although pedestrian access across lots tends to be informal in Nunavut communities, it is important to protect right of access by establishing legal right of ways in subdivision design.

Some open spaces serve other functions. Several communities have erected snow fences to prevent large accumulations of snow within the town site. Snow fences are generally oriented perpendicular (90°) to the direction of prevailing winds. The placement of a snow fence creates a large upwind and downwind snowdrift where lot development should not be proposed. These areas should be reserved as open spaces.

Location of parks

32. Parks and recreation spaces should be located so that most homes in the subdivision are within 300 metres, or five minutes walking distance, from a park.

33. Parks should front onto local roads to improve the accessibility and visibility of the park space to local residents. Where possible, design parks to be open to a road on at least two sides.

34. Locate larger parks and active recreation facilities close to schools, where possible, and ensure appropriate setbacks from residences.

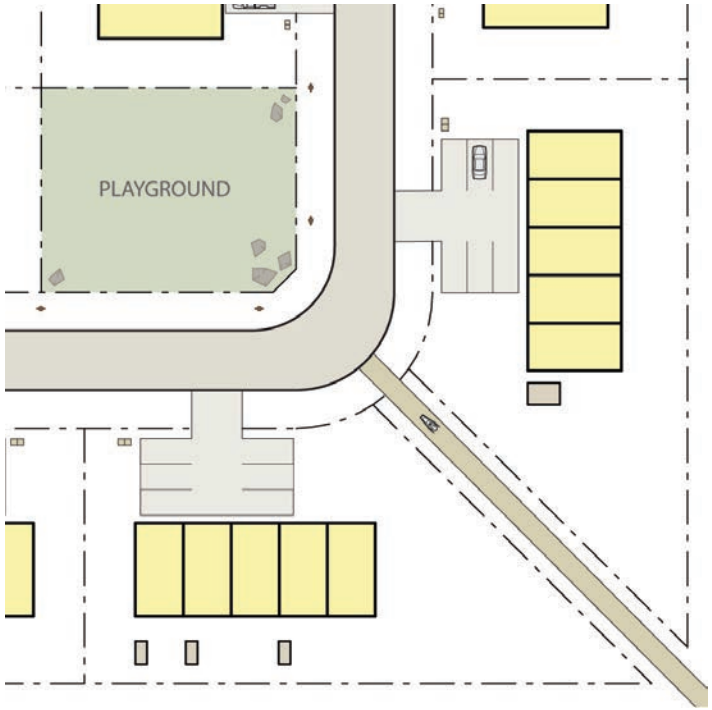

Figure 46: Playgrounds and other parks should be easily accessible to residents within the subdivision. Where possible, park and playground spaces should front onto two or more roads to improve supervision of the park by neighbouring residents.

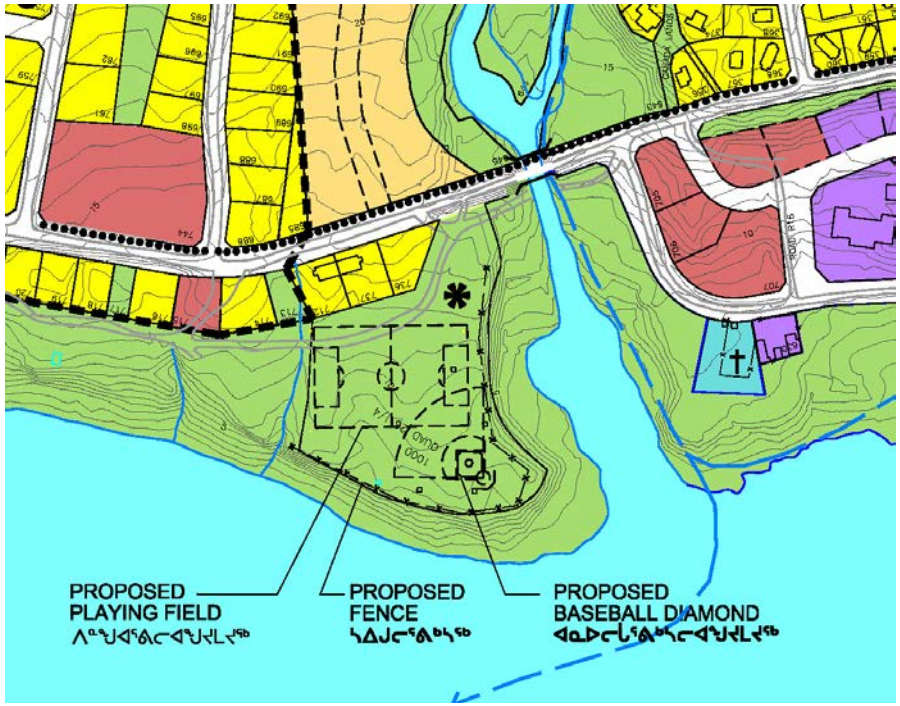

Figure 47: Adequate land areas should be set aside for playing fields (e.g. soccer field, softball diamond) in the design of new subdivisions, preferably in conjunction with schools and other community uses.

Size of open space lots for parks and playing fields

35. Open space lots should be sized in accordance with Table 10.

Pedestrian connections

36. Formalize pedestrian access through subdivisions by providing mid-block connections where appropriate. The mid-block connections should include a 6m wide right of way.

37. On collector roads, consider separating pedestrian and vehicle traffic using physical barriers such as boulders, guardrails or posts.

Snow clearing and piling onto open spaces

38. Consider whether snow cleared from roads and driveways will be stored within the subdivision or off-site. Dedicated snow piling areas may be identified on the plan. Consideration should be given to placing snow in open areas offering good drainage. This will avoid drainage and ponding problems in the spring when snow cover melts.

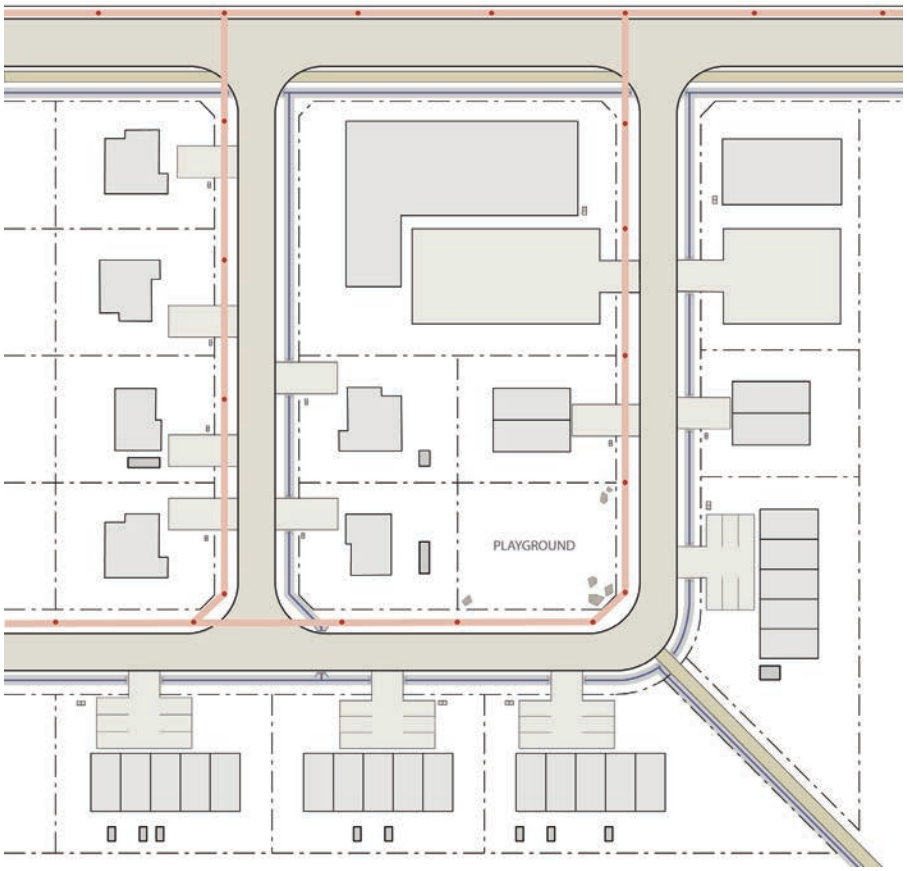

Figure 48: Power poles and power lines should be contained within the road right of way, typically on the opposite side from any drainage ditches and designated pedestrian walkways.

Table 10: Typical land requirement for various open space uses

Facility	Land Requirement
Basketball court	500 – 750 m^2
Baseball /softball diamond	2,500 – 5,500 m^2
Soccer field	3,000 – 7,000 m^2
Neighbourhood playground	1,500 – 2,000 m^2

Snow fence reserves

39. If a snow fence is to be installed as a part of the development of a new subdivision, create a snow fence reserve of at least 60 metres on the upwind side and 150 metres on the downwind side. No development should be permitted within the snow fence reserve.

Figure 49: Snow fence with resulting drift zone.

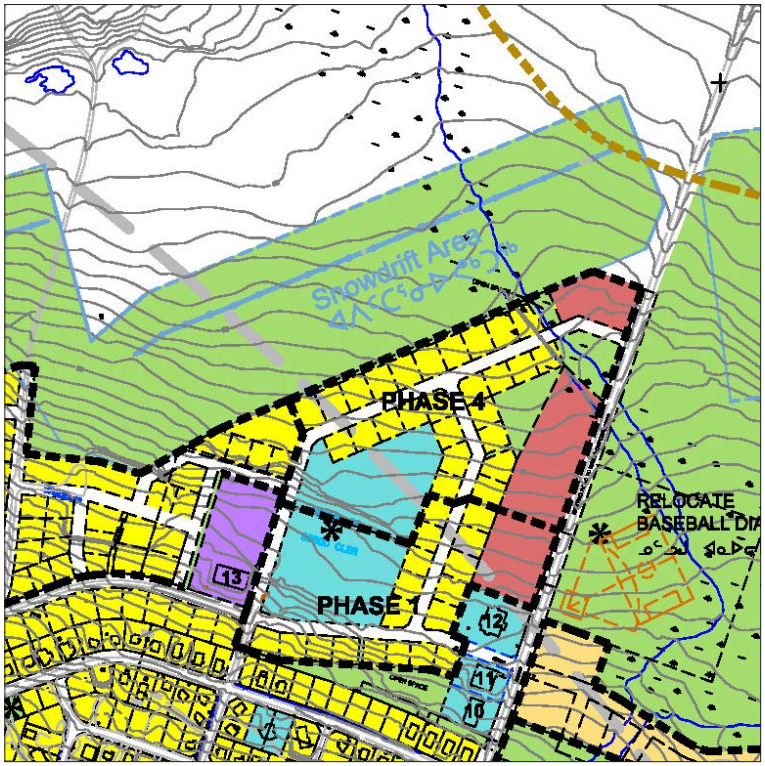

Figure 50: Snow fences create large upwind and downwind snow drifts. Any snow fences located near a subdivision should be placed within appropriately-sized snow drift reserves where development is prohibited.

STANDARDS FOR UTILITIES

Most Nunavut communities have trucked municipal water and sewer services. At present, only Iqaluit, Rankin Inlet and Resolute Bay are equipped with piped services. Each of these three communities has developed their own piped services system and standards to suit local community needs. While local community standards are to be followed, Municipal Planning Engineers are responsible to ensure that the water and sewer systems are designed and constructed according to accepted engineering practices. The standards in this section are intended as a guide and shall not be considered as a substitute for detailed material and construction specifications prepared by a qualified engineer.

Other utilities that need to be considered in subdivision design include electricity, telephone and television services. Qulliq Energy Corporation is responsible for installing infrastructure such as electricity poles and electrical distribution lines within Nunavut communities. NorthwesTel is responsible for the installation and maintenance of telephone lines, and Arctic Cooperatives Limited is responsible for cable television services in most Nunavut communities. As the owner and installer of utility poles, Qulliq Energy Corporation has created a Joint Use Agreement to regulate the use of utility poles by all three utility services.

Existing utility infrastructure

40. Existing utility infrastructure should be located within new road rights of way or dedicated utility rights of way. Any new lots being created should not encroach on existing utility infrastructure (e.g. power poles, overhead lines, underground pipes, access vaults, fuel pipeline, telephone lines, etc). There may be special circumstances where relocation of existing infrastructure is required. In these cases, consultation with relevant authorities should be undertaken.

Figure 51: Power poles and piped municipal services are typically installed in the road right-of-way prior to construction of housing and other uses.

Location of utilities

41. Telephone, electricity poles and street lighting should be placed within the road right of way at the edge of the traveled road surface. Where it is not possible to place utility poles within the right of way, they should be placed along lot lines in a manner that the overhead wires follow the lot lines. Utility lines should not cross lots that are developed or zoned for development.

Setbacks from power poles and power lines

42. All buildings and structures must be setback a minimum of 3.05 metres from any power pole or power line.

Power line clearance above roads

43. Power lines must respect the following clearances:
    a. 5.5 metres across a road;
    b. 4.0 metres across a driveway to a residential lot;
    c. 5.0 metres across a driveway to a commercial, community, or industrial lot;
    d. 3.5 metres across a pedestrian, ATV or snow machine trail or access point.

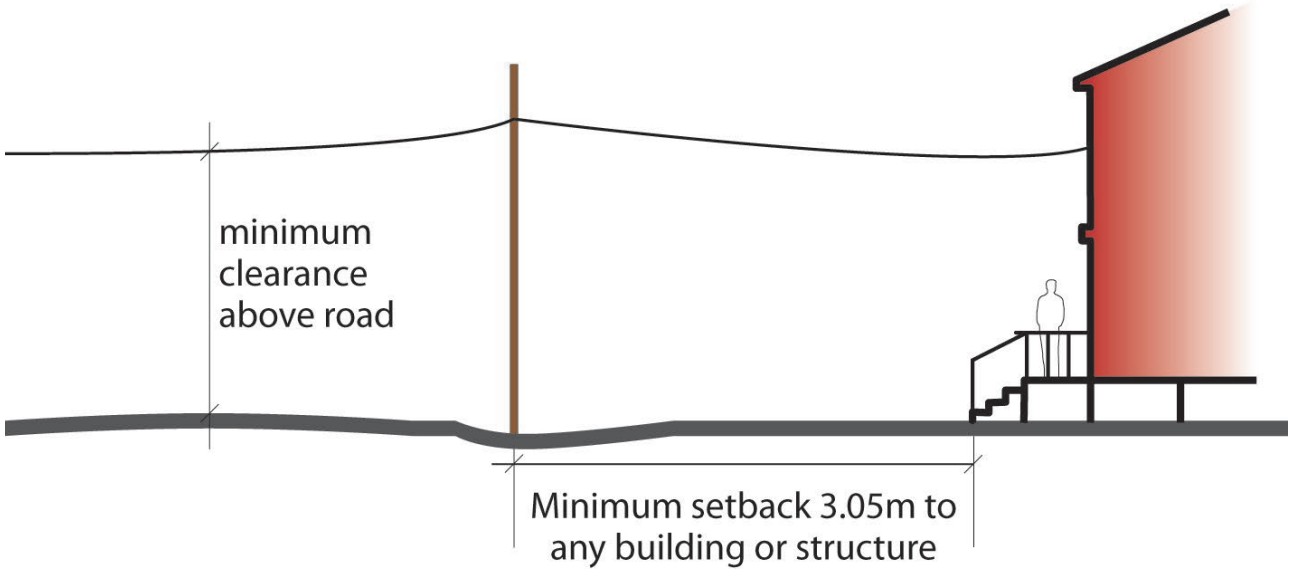

Figure 52: Power poles and power lines must be setback from buildings and structure and must provide for minimum clearance above roads and other travelled surfaces.