

CORE CONCEPTS

Created by Mining Matters



**Social and Environmental
Responsibility**



Did you know that there are complementary and additional resources that will assist with the delivery of this topic? Please contact Mining Matters and we'd be happy to assist. Be sure to state, "Core Concepts order request" in the subject line of the email and/or the fax cover sheet.

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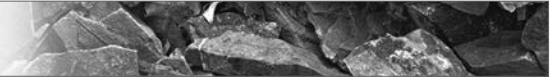
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TABLE OF CONTENTS

1	Operating a Surface Mine	4
	Information Bulletin	6
	Reclamation and Rehabilitation	8
	Creating a Surface Mine Model	9
2	Wakima - A Case Study	10
	Information Bulletin	11
	Wakima Town Map	12
	Questions and Activity	13
3	Wakima - Research and Roles	14
	Student Roles	15
	Wakima Town Map	18
4	Wakima - Debate and Decision	19



MATERIALS

- Information Bulletin - *The Mineral Resource Development Cycle*
- NRCan Surface Mine poster
The mining posters: *Surface Mine, Underground Mine, Smelter, and Concentrator*, can be downloaded from the Mining Matters website at <http://www.pdac.ca/mining-matters/resources/education/additional-posters>
- Reclamation and Rehabilitation photo cards
- Reclamation Stories
Canadian Land Reclamation Stories
<http://www.clra.ca/default.aspx?page=29>
photos included
- Teacher instructions on "Creating a Model Surface Mine Model."
- 1 plastic container (250 ml) for each group
- Approximately 4 litres of country rock material (see *Creating a Model Surface Mine for suggestions*)
- Approximately 300 ml of target mineral/rock material (see *Creating a Model Surface Mine for suggestions*)
- 6 squares of brown construction paper or fabric
- Tree and grass cut-outs or 6 natural habitat magazine pictures
- 6 plastic spoons
- 6 paper cups



SUMMARY OF TASK

Students will:

- Investigate the effects of resource extraction on the land, and the processes of reclamation and rehabilitation.

EARTH SCIENCE LITERACY PRINCIPLE(S)

BIG IDEA 7 Humans depend on Earth for resources.

BIG IDEA 9 Humans significantly alter the Earth.

OBJECTIVES

1. To operate a model surface mine model provided by the teacher.
2. Investigate how mining companies extract valuable minerals that are close to the surface of the Earth and then reclaim the land after the process.

INSTRUCTIONS

Engage

1. Distribute Handout *Information Bulletin - The Mineral Resource Development Cycle* and discuss and explain the stages.
2. Review the *Surface Mine* poster with the students. Show students how the overburden (surface soil and loose rock) is removed and how drilling and blasting breaks the rock. Large trucks and diggers move the rock to the crushers and processing plant where the valuable materials are separated from the host rock.

Explore


3. Explain to students that they will mine their model of a surface mine for either a valuable rock or mineral.
4. Ask students to draw a picture of their model and make a group list showing the steps they will follow to mine, and later reclaim, their model.
5. After the plan has been approved, have students start the extraction process:
 - a. Extract the rock and mineral mixture and place it on the table.
 - b. Separate the target mineral from the host rock. You will need to instruct students on the method to use, depending on the materials you chose for the models. Keep the mineral in a paper cup.
 - c. Draw a picture of what their surface mine looks like during mining remembering to include the pile of rock that was taken out of the mine.

Explain

6. Have students answer the following questions:
 - a. How has mining changed model the landscape.
 - b. How could we use the pile of mined-out rock that was taken from the surface mine?

Elaborate

7. Have students reclaim the surface during and after mining is completed, returning the land to useful purposes. Emphasize the fact that even with the best technology, reclaimed mine lands may never be returned to its pre-operation state.
8. Students should draw a picture of the land after mining.

- 
9. Ask each group to share their extracted valuable rocks/minerals with the class. Discuss with students the steps of their mining and reclamation operations and any differences between the original model and the model after reclamation. It is important to note that the reclaimed pit may not look exactly the same as the original model. For example, students may note that there is a depression due to the missing minerals that were extracted. Discuss whether the animals, trees, and plants can be returned to the area immediately, as well as the time factor involved in restoring a landscape.

Evaluate

10. Show students the Reclamation and Rehabilitation photographs of mine sites before and after the land has been reclaimed.
11. Students will write three things that have been done to reclaim the land used for mining.

SUPPORTING INFORMATION

The Surface Mine poster shows the characteristics of a surface mine and the stages used in a typical surface mine operation.

Two common procedures used to separate minerals from rocks take advantage of the physical properties of the sought materials. When mixed with liquid, heavier or denser minerals sink, and therefore can be separated from lighter minerals. This procedure is called **heavy media separation**. This process could be used to separate heavier chalcopyrite from lighter quartz when mining for copper and nickel. If the valuable minerals are magnetic, they can be separated from other rock and minerals by passing the crushed ore under a powerful magnet. This procedure is called **magnetic separation**.

When reclaiming a surface mine, even if all the remaining rock (called “waste” rock, meaning rock devoid of valuable mineralization) were replaced into the surface mine, the depression formed by mining would not be refilled completely. However, the wall of the depression can be contoured to gentle slopes, the surface can be covered with topsoil, and grass and trees can be planted to create a naturalized landscape or environment. In some cases, mined-out surface mines and rock quarries have been made into recreational lakes, public parks, rock gardens, and farmland.

Mining companies use grass to stabilize slopes and reduce soil erosion, and they plant seeds and seedlings to encourage the establishment of plant and tree communities. As the plants and trees mature, animal species diversity increases in the area. The habitat reclamation process is highly monitored by scientists from many disciplines.

Key Words:

Basic Terms: heavy media separation, magnetic separation, rock, mineral, mineral resource development cycle, mining cycle, mineral exploration, staking a claim, mineral evaluation, surface mine, open pit, tailings, separation process, refined, processing

Secondary Terms: geologists, underground mine, environmental specialists



SAFETY

- If food is used as the target rock/mineral or country rock/waste, ensure that there are no allergies before proceeding. Students should be encouraged to wash their hands after manipulating the models.

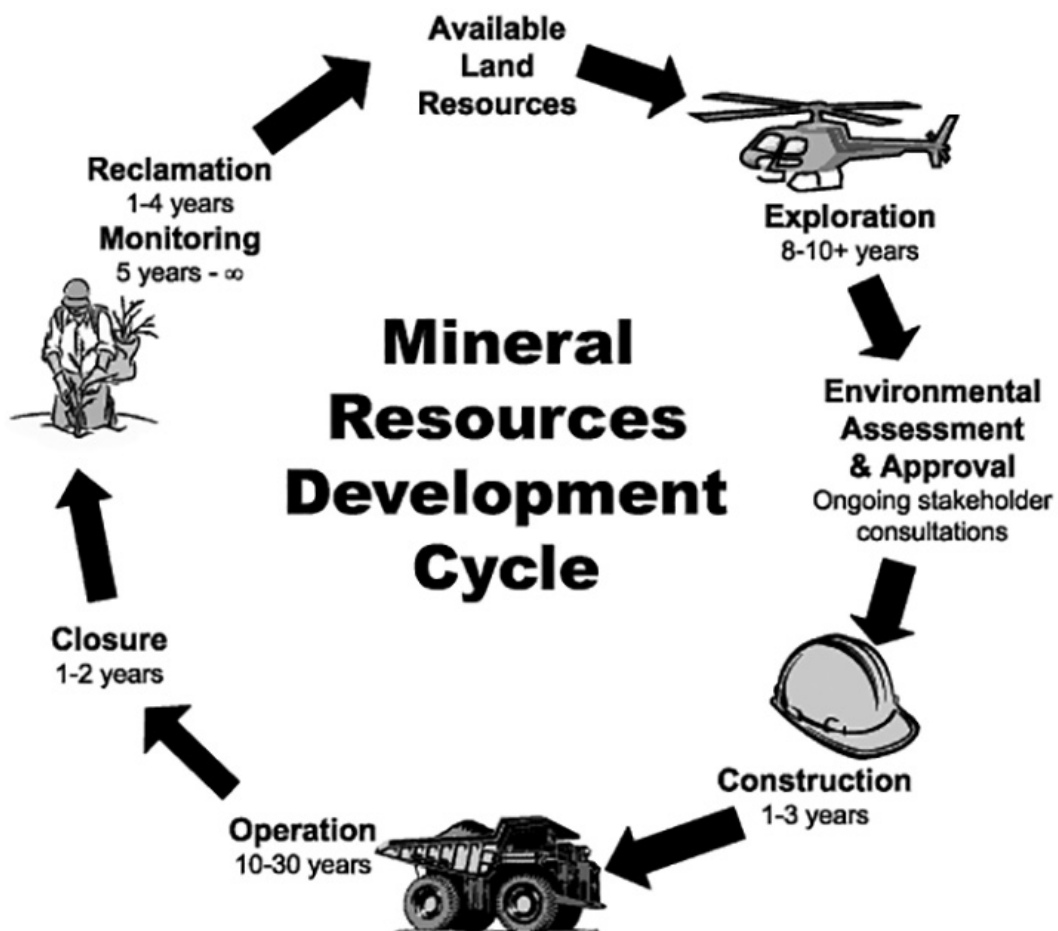
THE MINERAL RESOURCE DEVELOPMENT CYCLE

Mining is an industrial activity that removes **rock** from the Earth's crust and processes it to remove valuable **minerals** for us to use. We need mineral resources to make many of the things we use in our daily lives, from toothpaste to buildings, computers to cars.

The **mineral resource development cycle (mining cycle)** is very complicated and generally involves five stages:

- looking for minerals;
- evaluating a mineral discovery;
- building a mine;
- mining and processing minerals;
- and closing the mine and reclaiming the land.

From start to finish, a mining company has to think about how its activities will affect the environment and any nearby communities. The mining process can take a very long time and cost millions of dollars.





Looking for Minerals

Looking for minerals is called **mineral exploration**. Geologists use many different methods to look for valuable minerals. They study satellite images of the Earth and use airplanes or helicopters to measure things, such as the magnetism in the land. Maps also help them choose an area to explore.

Before a mining company can explore more closely, it must get the exclusive rights to a piece of land. This is called **staking a claim**. The company can then use special equipment to look more closely for mineral deposits. Geologists do field work to identify different rocks and collect rock and soil samples to study in a laboratory. If the results are good, the company drills holes in the ground to take out long, thin cylinders of rock called cores, which can be studied to find out how much valuable mineral they contain.

Evaluating a Mineral Discovery

Once a mining company finds a mineral deposit, the next step is to decide if it will be worth spending the millions of dollars needed to construct a mine. A **mineral evaluation** looks at how much it will cost to construct and operate the mine, to sell the minerals, to take care of the environment, and whether or not the company will make any money. Finding a good mineral deposit is rare. Very few mineral exploration properties actually make it to the mineral evaluation stage of the mining process.

Constructing a Mine

Mineral deposits close to the surface of the Earth can be mined by digging a **surface** or **open pit** mine. This means using huge diggers to scrape away the surface material and blasting the solid rock with explosives to reach the valuable minerals. Mineral deposits buried deep in the Earth have to be mined using an underground mine. This means digging tunnels into the Earth to reach the valuable minerals.

Mining and Processing Minerals

Actual mining can begin once construction of a mine is complete. Miners use drills and explosives to break up the rock and large scoops and machines to move the rock to the processing plant.

Mined rock contains valuable minerals as well as worthless ones, all mixed together. **Processing** separates out the valuable minerals from the waste. Usually, the rock is first crushed into a fine powder. Then, a **separation process** captures the small amount of valuable minerals from the large amount of powdered waste rock. Some minerals are then refined to produce pure metal in a process called smelting. A mining company has to deal with the leftover waste materials, called **tailings**, which are rock fragments, dust, and chemicals. They must be stored in safe areas to avoid polluting the air or water.

Closing a Mine and Reclaiming the Land

No mine will last forever. When a mine closes, the mining company has to reclaim the land, making it safe, usable, and a natural part of the surrounding environment. It must remove the buildings, make sure mine waste doesn't harm the environment, make any pits or tunnels safe, and replant the land with grass and trees.

Protecting the Environment and Connecting with Communities

At every stage of the mining process, environmental specialists study the soil, water, wildlife, and vegetation, as well as the air quality and climate, to make sure an area remains safe and can be returned to usable land when mining is complete. The company also goes to local communities to learn about the area, explain the mining plans, answer questions, and talk about work opportunities.

BEFORE AND AFTER RECLAMATION**Underground Mine**

Photo of Quirke II Mine, Rio Algom Limited
– Elliot Lake , Ontario prior to reclamation.



Photo of Quirke II Mine following removal of buildings and
prior to reseeding and planting.

BEFORE AND AFTER REHABILITATION**Sand and Gravel Pit**

Photo of the Fonthill Pit, Steed and Evans Limited,
Fonthill Ontario during rehabilitation.



Photo of the Fonthill Pit showing final rehabilitation.

1

CREATING A SURFACE MINE MODEL



1. Create one model of a surface mine for each group of students. There is considerable flexibility in the materials that may be used: the general principle being to have a valuable mineral or rock that must be separated from a waste or country rock component. Look at the suggestions in the table below; you can substitute the different valuable target minerals/rocks into alternate country rock.

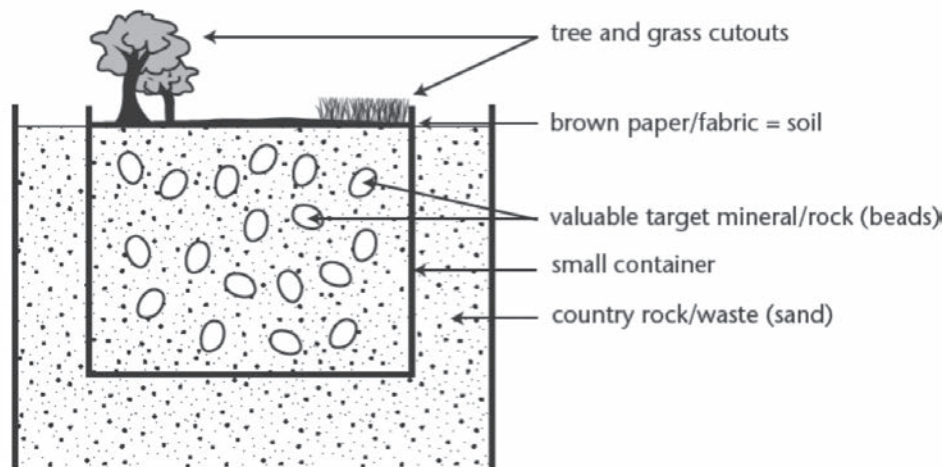
Valuable Target Rock/Mineral	Separation Process	Country Rock/Waste
Magnetic beads	Using a magnet	Sand or gravel
Paper clips	Using a magnet	Potting soil
Dried beans	Physical picking with fingers or tweezers	Pasta
Large sunflower seeds	Sieving, physical picking with fingers or tweezers	Small-gran bird seed
Coloured beads	Sieving, physical picking with fingers or tweezers	Rice
Peanuts in shells	Crushing and sieving	Peanut shells



2. Build the target rock body or mineral ore.
 - a. In a small container (~250 ml), mix a 4:1 ratio (200 ml: 50 ml) of country rock/waste material and valuable target rock/mineral.
 - b. Lay brown construction paper or fabric on top of the rock to represent soil.
 - c. Place tree and grass cut-outs or magazine pictures of natural habitats on top of the soil.
3. *(Optional)* Put the target rock body or ore in a wider environment.
 - a. Rest the smaller container inside a larger container (750 ml or 1 litre). Fill the area around the inner container with the same country rock material as it contains, making sure that the rim of the inner container can be seen after filling.

OR

 - b. Submerge the small containers in a sand table, making sure the rims can be seen.



MATERIALS

- Figure: *A Discussion on Development - Town of Wakima* (Displayed on available classroom projection technology)
- Handout: *Wakima – A Case Study Information Bulletin*
- Handout: *A Case Study Questions Activity*

Natural Resources Canada's Minerals and Metals Sector develops and distributes a number of information products on Aboriginal participation in exploration and mining.

<https://www.nrcan.gc.ca/mining-materials/aboriginal/bulletin/7817>

**SUMMARY OF TASK**

Students will:

- Identify the factors that must be considered in making informed decisions about land use (e.g. environmental impact, jobs, present and future values of natural resources).

EARTH SCIENCE LITERACY PRINCIPLE(S)

BIG IDEA 7 Humans depend on Earth for resources.

BIG IDEA 9 Humans significantly alter the Earth.

OBJECTIVES

1. Become familiar with the *Wakima – A Case Study Town Map*.
2. Use the map information for informed participation in the class debate.

INSTRUCTIONS**Engage**

1. Review map reading skills with students (use of legend, scale, etc.)

Explore

2. Have student examine figure: *A Discussion on Development - Town of Wakima*.

Explain

3. Distribute the handout: *Wakima – A Case Study Information Bulletin*.

Elaborate

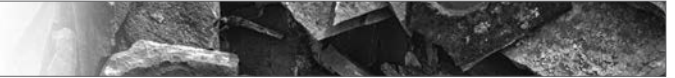
4. Have students answer the questions on the handout: *A Case Study Questions Activity*.

Evaluate

5. Have students present their views using a *vote with your body* strategy. Set up signs at 4 sides of the room: For, Against, Unsure or Don't Know, Not Interested or Don't Care. Pose the question to students: "How would you feel if a mining operation were proposed near to where you live?" Give students 1 minute to consider their view, and then they move to stand by the appropriate sign. Ask a few students in each group to share more about their point of view. All responses are valid, so long as the factual basis is correct. The distribution of students between each point of view may be used as a baseline on which to consider changing opinions as the following activities are completed. This evaluation task can be repeated at relevant times.

SUPPORTING INFORMATION**Answers to Questions Activity**

1. 750 m (0.75 km) northwest
1,500 m (1.5 km) northwest
1,200 m (1.2 km) north
700 m (0.7 km) west
2. 425 m
3. Beaver dams
4. Airport, railway and major highway



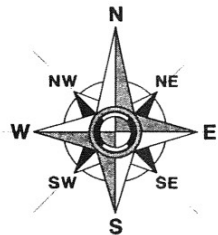
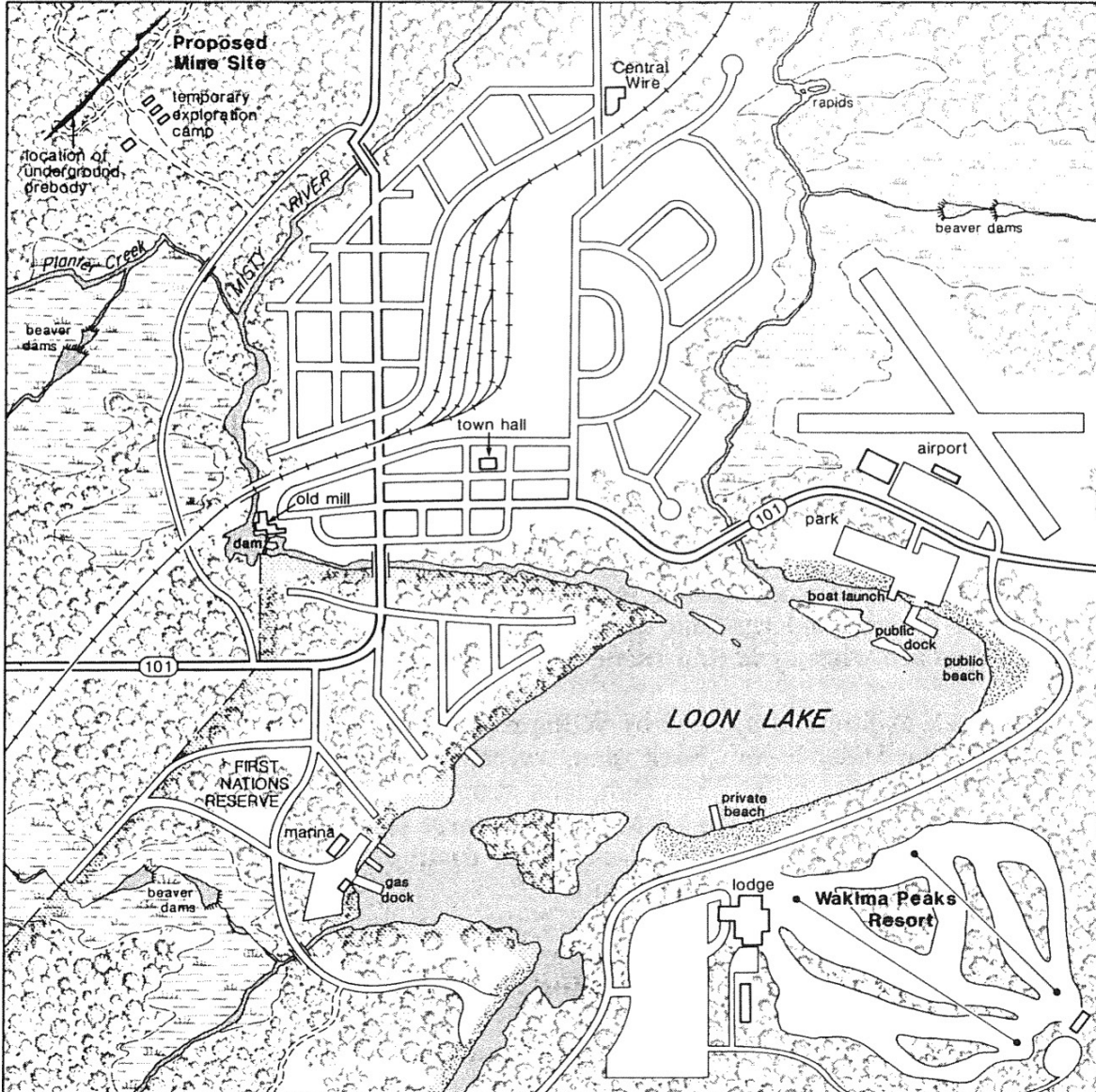
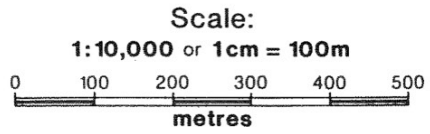
WAKIMA – A CASE STUDY

Wakima is a fictitious town in the northern part of your home province or territory. Trillium Mines is proposing to open a new underground nickel mine, based on the discovery of a large orebody close to the town. The building of a large mine near any community prompts questions and discussion and the town of Wakima will experience a debate that brings together many of the interested groups from within the community and beyond.

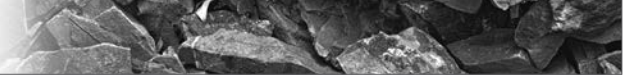
William Simmons founded Wakima in 1846. Mr. Simmons built a sawmill at a waterfall on the Misty River and supplied lumber for use in the gold mines, 10 kilometres to the east, until the early 1900's. Since then, Wakima has become a well-established community with a regional rail maintenance yard and switching site. Although it is a strong community, Wakima has experienced a slow down in its economy in the last few years. Some businesses have had to close and many young people have had to leave Wakima in order to find employment. A ski resort has been developed nearby, which has attracted some seasonal business. Tourists like to come to the town because there is very little industry and the surroundings are still natural and attractive.

Trillium Mines has made a proposal to the local town council to build an underground mine on its forested property just outside of Wakima. The mine would create 200 direct jobs and 450 additional spin-off jobs. The town population of 5,000 would increase to 6,000 and new services would be needed to meet the demands of the new residents. Some people favour the mine, as it will bring development and resources to the town while others are concerned about the altering of the local environment or a possible increase in pollution.

The town council is ready to debate the issue of whether or not the mine should be built. You will be assigned a role within an interest group that brings a particular point of view to the discussion. You need to help research the group's viewpoint and form an argument that supports, with examples, this point of view. Make sure that you can respond to opposing group's arguments, as well. Once the debate has been concluded, all debate participants will vote, according to their personal opinion, as to whether or not Trillium Mines should be allowed to go forward with their project.



- Legend:**
- highway
 - road
 - trail
 - railway
 - buildings
 - forest
 - wetland
 - water
 - shoreline
 - beach



1. Considering the map's scale and using a straight line, how far and in what compass direction is the proposed mine site from:

The town hall

Wakima Peak's Ski Lodge

The gas dock at Loon Lake Marina on the First Nations Reserve

Central Wire Building

2. How long is the east-west runway of the airport?

3. What signs of wildlife are there in the area?

4. What facilities are already present in Wakima that would be useful to industry in the area?

5. If the mine were built, how might the area and life in the town be affected? Answer in 4 or 6 sentences. Be sure to consider both potential benefits and potential problems. What actions could be taken to reduce the potential problems?

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MATERIALS

- Figure: *A Discussion on Development - Town of Wakima* (Displayed on available classroom projection technology)
- Handout: *Wakima – Research and Roles*

Natural Resources Canada's Minerals and Metals Sector develops and distributes a number of information products on Aboriginal participation in exploration and mining.

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Towards Sustainable Mining (TSM) is the Mining Association of Canada's (MAC) commitment to responsible mining. It is a set of tools and indicators to drive performance and ensure that key mining risks are managed responsibly at our members' facilities.

<http://www.mining.ca/towards-sustainable-mining>



SUMMARY OF TASK

Students will:

- Identify the factors that must be considered in making informed decisions about land use (e.g. environmental impact, jobs, present and future values of natural resources).

EARTH SCIENCE LITERACY PRINCIPLE(S)

BIG IDEA 7 Humans depend on Earth for resources.

BIG IDEA 9 Humans significantly alter the Earth.

OBJECTIVES

1. Work in small groups to develop a point of view and points for discussion and debate based on information provided and research.
2. Discuss both the positive and negative aspects that can come with a mine being opened in a community.
3. Be familiar with the social, cultural and economic aspects required for full participate in the class debate.

INSTRUCTIONS

Engage

1. Review with students the activity 2: *Wakima – A Case Study*.
2. Review with students the concept of a debate and its purpose in governance.
3. Clarify the steps of getting ready for debate and how the voting process will proceed.

Explore

4. Divide students into 6 groups and give each group a handout with a role from the handout: *Wakima – Research and Roles*.
5. Students will meet with their group and discuss their situation clarifying any terms or aspects of the assignment.

Explain

6. Students will prepare strategies with which to present their point of view.
7. A spokesperson should be appointed from each group. These students will then present their group's specific situation to the class, the fellow citizens of Wakima.
8. All groups will listen carefully to other's point of views so that the group can develop its responses to any issues that will arise in the debate.

Elaborate

9. Each group will meet again to discuss the information presented by other groups and prepare solutions to the issues that were raised.

Evaluate

10. Explain to students the next step in this case study: Activity 4 Debate and Decision. Provide them notice of the evaluation criteria that will be used then for their contribution to the debate.



SUPPORTING INFORMATION

The town debate will decide if Trillium Mines Incorporated will be allowed to open up an underground mine on its Planter Creek Claims in Wakima. Wakima town council will soon debate the issue whether the mine should be built and under what circumstances. Six groups are going to present their point of view at the local meeting on this issue.

Key Words:

Basic Terms: orebody, reclamation plan, tailings, concentrate, emissions, milling, contamination, headframe, viable

3 STUDENT ROLES



ROLE 1

Trillium Mines Incorporated

Your company, Trillium Mines, has been in the mining business for 15 years and specializes in nickel mining. Four years of exploration work on the Planter Creek Claims, in the Wakima area, has resulted in the discovery of a significant **orebody** of nickel. It is estimated that the amount of nickel found can be mined for at least 20 years. There is currently a shortage of nickel in the world, and in view of the profitability of this operation, you would like to get started on your mine immediately. Recognising the environmental concerns of the town, you have an excellent **reclamation plan** ready to present to the community. When your project shuts down in 20 years, the buildings will be removed, the property landscaped and the **tailings** pond site treated and seeded.

Your mine will create 200 direct high paying jobs. The average miner salary will be approximately \$50,000. In addition, you have negotiated with the Wakima First Nations people to provide training and employment to some of their members to fill 10% of the direct jobs. New homes, schools, restaurants and services will be built if your mine is given the go ahead and 450 spin-off jobs will result in the province.

You will be mining and producing a nickel **concentrate** at the site and you will ensure that emissions are kept to industry and government standards. Should you be given permission to build a mine, you are prepared to build a Sports-Community Centre for Wakima including an arena and an indoor pool.

ROLE 2

Provincial Government Ministries

(1) Ministry of the Environment

The Ministry of the Environment's job is to protect the environment. You are concerned about the proposed Trillium mine for the following reasons:

- Trillium Mines is proposing to build a mine in a forested area where moose travel regularly. The noise caused by the mine may affect mating patterns and disrupt the moose of the area. You need to review the environmental impact studies carried out by the company.
- You need to know from Trillium Mines whether or not there will be any dust and other airborne **emissions** from machinery and processes used by the mining company.
- You want to make sure that none of the chemicals used in the **milling** process will leak into the streams of the area and that no **contamination** of groundwater occurs from the tailings disposal area.



(2) Ministry of Northern Development and Mines

The Ministry of Northern Development and Mines' job in this case is to assist Trillium Mines with advancing their mining project. You want to assist Trillium Mines for the following reasons:

- Your Ministry is concerned with the economic development and wellbeing of communities. Mining is an important economic activity.
- The Government has developed a set of rules for the safe construction, operation and rehabilitation of mines. You ensure that Trillium Mines follows these rules.
- Other Ministries and groups have concerns and questions and are sometimes opposed to mine development. You help Trillium Mines deal with these concerns by suggesting solutions to the issues.

ROLE 3

The Economic Development Commission of Wakima

The Economic Development Commission of Wakima is composed of business people. You are in favour of allowing Trillium Mines to mine for the following reasons:

- The mine will create 200 direct jobs and 450 indirect ones. New people will be attracted to the town sparking more economic activity.
- If the project goes ahead, Trillium Mines will build a new \$3 million community centre with a pool, arena and auditorium/theatre. Cineplex Odeon will build a cinema. Your members hope to get construction contracts.
- You have heard rumours that Central Wire, a small 50-employee company in the town, may close. If the new mine opens, the effect of the job losses at Central Wire may be lessened. Possible wire sales to the new mine may even keep Central Wire in business.

ROLE 4

"Life Without a Mine is Just Fine" Committee

Upon receiving word that Trillium Mines was seeking to open a mine in the Wakima area your group formed the "Life Without a Mine is Just Fine" committee. Your group is very concerned that mining will not only destroy the property value of area homes, but will ruin the environment. Your concerns are:

- The mine will lead to the construction of new homes and businesses and a more crowded town life.
- The mine site will be very ugly and the forest will be destroyed to make way for this project.
- The pollution that the tailings may generate could affect animal, plant and even human life in the area. Many people like life in Wakima because there is currently no air pollution.
- The moose population in the area will be driven away and some of the aboriginal people won't be able to practice traditional winter moose hunting. As well, moose mating habits may be affected by the mining operation.
- The mine may create noise pollution. Heavy trucks and equipment may cause unwanted noise.
- Skiers who use the ski hills in the area would not like to see a mine **headframe** and cleared area as they ski down a hill that at this moment has a beautiful panoramic view.



ROLE 5

The First Nations Cultural Protection Committee

Your group represents the aboriginal people living on the Wakima First Nations Reserve. Your people have been living on the reserve for over 80 years. Your people go moose hunting in the winter and depend on this activity to supplement their annual food supply. You have formed a committee to protect aboriginal concerns for the following reasons:

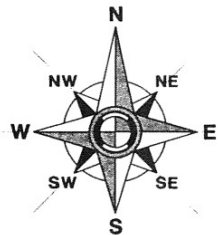
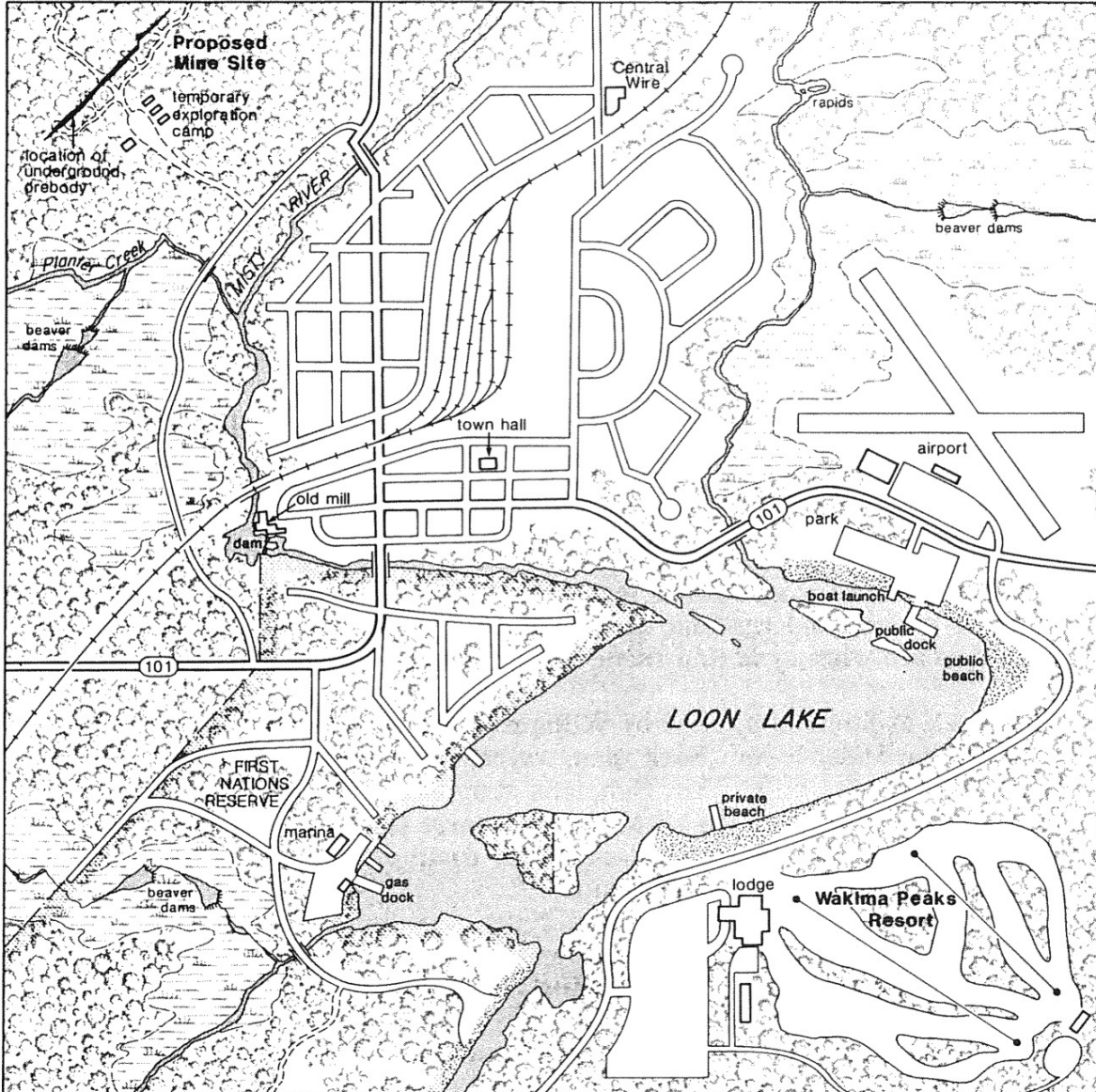
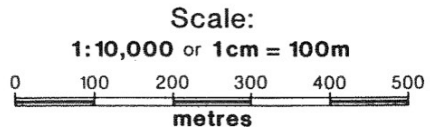
- The construction of the mine may bring noise, dust and pollution to an area immediately north of the inhabited section of your reserve.
- The moose population may be affected by mining and this would directly interfere with the hunting tradition of some of your community members.
- The protection of plant and wildlife is very important to your culture and further destruction of it will result in your way of life being negatively affected.
- You are worried that if the tailings pond is not properly monitored, certain substances may leak into local streams and affect the fish and wildlife.
- Certain community members conduct nature tours of the local forest area. They show the local wildlife to tourists. If the mine is built they are concerned that the wildlife will flee and their jobs will be eliminated.
- Some of your band members would like to get a job at the new mine so you must be careful to ensure the concerns of all of your members are met.

ROLE 6

Concerned Citizens for Progress

Your group represents the Concerned Citizens for Progress, and was formed to support the mining project because you believe that:

- If the mining project goes ahead, there will be new industry and jobs in the town. New restaurants and shops will be built making town life more interesting.
- Trillium Mines has promised to build a new sports complex and community centre if it receives permission to mine in the Wakima area. The local theatre group has no locale at present and has plans to convert the scenic old mill site into a centre for the performing arts. Increased population and resulting taxes in the town would make the project economically **viable**.
- Many parents in the community, along with students at local schools, would like a sports complex. At present, Wakima lacks an arena and indoor pool. Young people would be better served with a sportsplex and would be kept off the streets during their teenage years. As well, with more restaurants and shops, there would be more part-time jobs for the town's youth.
- Lack of facilities prevented touring groups from visiting the town. If the old mill site is converted, travelling theatre and dance groups could perform in town.



- Legend:**
- highway
 - road
 - trail
 - railway
 - buildings
 - forest
 - wetland
 - water
 - shoreline
 - beach



MATERIALS

- Student-generated research and material from Activity 3 relevant for the debate presentation.



SUMMARY OF TASK

Students will:

- Identify the factors that must be considered in making informed decisions about land use (e.g. environmental impact, jobs, present and future values of natural resources).

EARTH SCIENCE LITERACY PRINCIPLE(S)

BIG IDEA 7 Humans depend on Earth for resources.

BIG IDEA 9 Humans significantly alter the Earth.

OBJECTIVES

1. To work in small groups to write and present a point of view based on information provided.
2. Discuss both the positive and negative aspects that can come with a mine being opened in a community.
3. Be familiar with the social, cultural and economic aspects required for full participation in the class debate.
4. Demonstrate communication and debating skills.

INSTRUCTIONS

Engage


1. Set-up the room as a meeting hall where a debate will take place. This requires a speaking area, a waiting area and a head table for those responsible for managing (adjudicating) the debate.
2. Discuss with the class the rules that will be followed during the debate. Explain that even though they may disagree with some aspects of their assigned role, it is their job to present the most positive elements of their position as they can. Clarify what the role of a moderator will be and how the voting process will proceed. It should be mentioned that after all the points of view have been presented and discussed there will be a class vote on whether or not the mine will proceed. Each vote should be cast as an individual based on the information discussed in the debate and does not have to be according to the student's group stance.

Explore

3. Provide students with the evaluation criteria for their performance in the debate (see #8 below). Allow groups time to prepare their presentation according to these criteria and their previous research from activity 3.

Explain

4. The debate moderator is introduced, the mayor of Wakima (the great grandchild of William Simmons) and will be represented by the teacher.
5. Rules of the debate are stated for the record and meeting is started.

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6. During the group debate, the spokesperson for each group reads the group's position as to "yes" the mine should go ahead or "no" it should not and the reasons why. This debate can be done in two forms where:
 - a. All groups first present their information without outside interaction and then an open question period can be conducted or
 - b. Groups are put against an opposing side and then allowed a uniform time limit with which to present their case.

Elaborate

7. At the end of the debate, the mayor will ask everyone to vote. For the purpose of the vote everyone will be a town councillor and will vote individually whether or not the mine should be permitted. When deciding how to vote remind the students to consider the concerns of each group and what their proposed solutions were. The majority will decide if Trillium Mines gets to build the mine or not.

Evaluate

8. Use the following criteria to evaluate each group's communication and debating skills.
 1. Was the presentation well organized and effective?
 2. Did the team present plenty of empirical evidence to defend its position?
 3. Were the arguments presented in a logical and coherent way?
 4. Did the team use the allotted time well?
 5. Did the team recognize the weak points of the other sides and ask questions strategically?
 6. Did the team appear to know well both sides of the debate?

SUPPORTING INFORMATION

The town debate will decide if Trillium Mines Incorporated will be allowed to open up an underground mine on its Planter Creek Claims in Wakima. Students are expected to clearly identify the key factors; environmental, social, economic, etc that should be considered in order for the town council to make an informed decision.