Cookie Mining

Cookie mining: The purpose of this lesson is to understand the full cycle of mining minerals. We will glance at the economics of mining and its effect on the environment. You will be purchasing "land" (cookie) and "mining equipment" (flat toothpick, round toothpick, paper clip). You will mine the cookie (land) for minerals (chocolate chips) and then restore the land (reclaim the land through the process of reclamation) once you have finished mining. You will need to mine the minerals, quantify your minerals, reclaim the land, and complete the profit/loss worksheet. Manage your time wisely. Time is money in the mining industry!

Objective:

1. You will "mine" for ore (chocolate chips) with a goal of making as much money as possible while preserving the environment.
2. Your land permit allows for 10 minutes worth of mining and 2 minute of reclamation. You must abide by the following mining regulations:
    - You will start with $180 million, if your startup costs surpasses $180 million then you may take out a loan in hopes of paying it back with the profits made from your mining operation. Record any borrowed money in ***Part G. Profit/Loss Statement.***
    - You can only purchase one piece of land.
    - Hands may NOT be used at any point during mining (not even to hold the cookie). You may only use the mining tools to mine your land so purchase equipment wisely!
    - Mining Equipment CANNOT be shared nor can it be purchased once mining has begun
    - If a piece of equipment breaks you may fix it with one piece of tape (located at the front of the room) for the cost of $10 million but whatever time lost to repairs cannot be made up.
    - You will have 2 minutes to reclaim your land—this includes putting the cookie and subsequent crumbs back within the original scope of the mining operation. Additional time spent reclaiming will cost additional money ($10 million per minute), but cookie pieces/crumbs that aren't reclaimed will be subject to steep environmental fines ($5- $20 million)
    - All mined ore (chocolate chips) must be cleaned and transported to the processing plant on your paper.
    - Ore that moves outside of the Mining Area Grid (the desk, the floor, etc) cannot be retrieved.
    - AT NO POINT should you brush away, blow or remove crumbs- this will result in environmental fines.

Procedure:

1. Obtain your land and record the price of land under ***Part A. Land Acquisition.*** The land price is as follows:
    a. Low mineral cookie, hard land: $20 million
    b. Medium mineral cookie, soft land: $40 million
    c. High mineral cookie, dry land: $60 million
2. Place your cookie on the provided Mining Area Grid and trace. Looking from the side, sketch the topography (the natural, physical features of the land) on the "Pre-mining Topography" graph on ***Part B. Topography Study.***
3. Near your cookie, trace a 2x2 box that will serve as a processing plant for your ore.
4. Record the types of natural attributes impacted by your mining operation including the cookie placement as well as the processing plant. Record the number of squares/attributes directly impacted by your mining/processing placement and record in column two of ***Part C. Environmental Impact.***
5. Obtain your mining equipment. You may purchase up to THREE pieces of equipment (you can mix and match). Record your equipment choices under ***Part D. Equipment Costs.***
    a. Flat toothpick: $50 million
    b. Round toothpick: $70 million
    c. Paperclip: $90 million
6. Once all data is recorded, wait for teacher to officially commence your mining operation.

7. Once mining has been completed, your teacher will officially start the time for reclamation—you have 2 minutes to move all crumbs/cookie BACK into the circle you traced. Any grid with a crumb will face an environmental fine of $5 million per grid and/or $20 million per smudge. You may use additional time to reclaim at the cost of $10 per minute. Record this, if applicable, in ***Part E. Reclamation.***
8. Once mining has stopped your tablemates will collectively serve as Mining and Environmental Quality Assessors as well as determine the amount of successful ore retrieved.

As a Mining and Environmental Quality Assessor:

- ✓ Determine, collectively, how many grids contain cookie/crumbs the mining operation left behind-- the tiniest speck counts! Even if it's as big as this period → . it counts!
- ✓ Mark the grids that have crumbs/unreclaimed cookie- later shade each impacted grid
- ✓ The CEO of the mining operation will record this number in ***Part E. Reclamation***
- ✓ If any crumb/smudge is left unreclaimed on a natural attribute, record this in column 2 of ***Part C. Environmental Impact***
- ✓ Determine how many smudges (acid mine drainage) were left over after reclamation and record in ***Part E. Reclamation***
- ✓ Determine how many pieces of ore were successfully transported to the processing facility. Determine which ore is whole and clean, partial and clean, whole and dirty, as well as partial and dirty. Record this number under ***Part F. Mining Evaluation.***
- ✓ There is a 10% corporate tax rate on profits earned. Record how much is owed in taxes in ***Part F. Mining Evaluation*** by multiplying the profits by 0.10.

9. Draw the post-mining topography of your land in Part B. Topography Study
10. Once your land and ore have been assessed you may eat your cookie.

Post Mining Assessment:

The Mineral Area Grid contains:

- 41 Water squares
- 33 Trees
- 12 Areas rich in topsoil
- 10 Deer
- 9 Beautiful Vistas

1. Because the water flows from north to south, water that is compromised upstream can have an effect on water quality downstream. For any water square compromised (having a crumb/smudge), all **connecting** water downstream (below) is also impacted. Record how much water is affected in the third column in ***Part C. Environmental Impact.*** Put Xs through all polluted water icons on the mining area grid.
2. Topsoil requires 3 clean water squares to maintain moisture (it cannot share these squares with other patches of topsoil). Any top soil that loses moisture by not having enough water will be prone to erosion, Record how much top soil is effected in the third column in ***Part C. Environmental Impact.*** Put X's through all dried up top soil icons on the mining area grid.
3. A maximum of 3 trees need 1 square of rich topsoil to survive (they cannot share these squares with other clusters of trees). Record how many trees remain after your mining operation and record in the third column of ***Part C. Environmental Impact.*** Put Xs on all tree icons that die because of insufficient nutrients.
4. Each deer requires 3 tree squares and 3 water squares to survive (they cannot share these squares with other deer). Record how many deer are impacted by polluted water and a decrease in foliage in the third column of Part C. Environmental Impact. Put Xs on all deer that can no longer survive in the environment.
5. Vistas are aesthetically pleasing areas where people can enjoy the scenic view. In order for vistas to maintain their integrity, they cannot have a decrease in biodiversity or water pollution nearby. ANY box touching the vista (this includes the top and bottom corners) that has an X is tarnishing the aesthetic beauty of the vista, making it no longer appealing. Record how many vistas are altered in the third column of ***Part C. Environmental Impact*** and put Xs over them.
6. Staple your Mining Area Grid to the back of your lab.

Mining Assessment

A. Land Acquisition Costs

Name of land: _____ Total Land Cost: _____

B. Topography Study

Pre-Mining Topography (side view)	**Post-Mining Topography** (side view)

C. Environmental Impact

Natural Attribute	**Quantity Directly Impacted by Placement**	**Quantity Directly Impacted by Mining**	**Quantity Indirectly Impacted by Mining Operation**	**Remaining Healthy Natural Attributes**
Tree				
Deer habitat				
Rich Topsoil				
Water				
Beautiful Vista				

D. Equipment Costs

Equipment Type	**Quantity**	**Price**	**Total Costs**
Flat Toothpick		**50 mil**	
Round Toothpick		**70 mil**	
Paperclip		**90 mil**	
	Total Equipment Costs		
Repairs		**10 mill**	

E. Reclamation Cost

Reclamation	Quantity	Cost	Total
Additional time		$10 million	
Unreclaimed Grids		$5 million	
Smudges		$20 million	
		Total	

F. Mining Evaluation

Type of Ore	Quantity	Tons per chip	Price	Totals
Whole, clean		4 million	$15/Ton	
Partial, clean		2 million	$13/Ton	
Whole, dirty		4 million	$10/Ton	
Partial, dirty		2 million	$5/Ton	
			Total:	
Corporate Tax rate is 10%			Taxes to be paid:	

G. Profit/Loss Statement

Add up the following mining related costs to determine the amount of start up money needed/used:

	Losses
Total Land Costs	
Total Equipment Cost	
Money borrowed from bank **x 4.25% interest rate per year for 10 years**	
Equipment Repairs	
Reclamation Costs	
Taxes	
Facility Costs (office buildings, roads, utilities)	50 million
Operating Costs (fuel, salaries, maintenance repairs)	270 million
Environmental Costs (permitting, pre-mine studies including a $50 million bond)	80 million
Total	

	Profit
Money earned from retrieved ore	
Salvage credits (selling equipment, office furniture, computers, etc)	30 million
Reclamation Bond	50 million
Total	

Determine if you have made a profit or if you will have to file for Chapter 11 bankruptcy.

Subtract total costs (losses) from start up cost of $180 + income (profit): _____

If the answer is positive you made a profit!
If the answer is negative you suffered a loss!

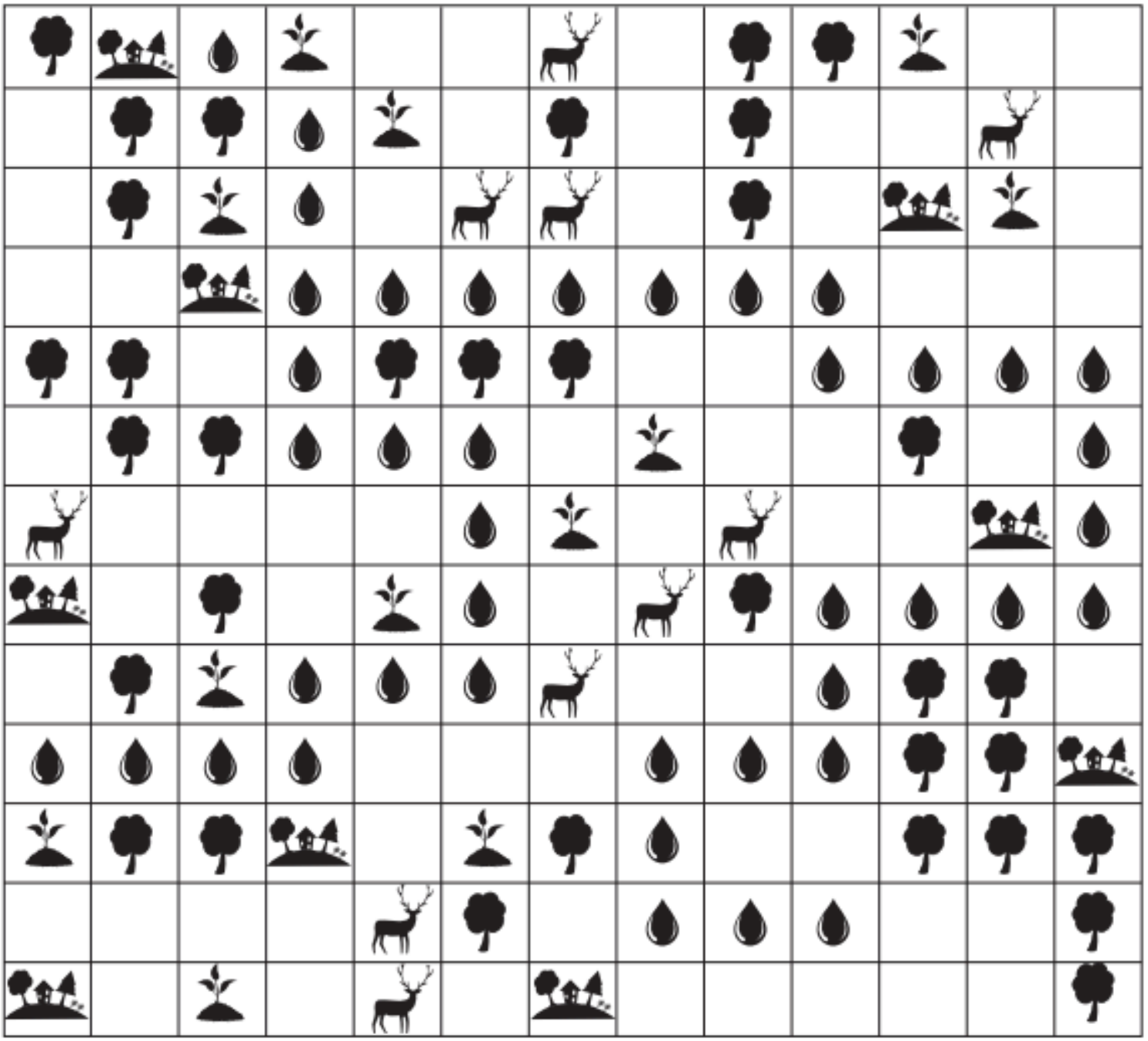
Final Disclosure Statement:

_____ reports a net _____
Company's Name (profit/loss)

Of $_____ for quarter 2, _____.
(amount calculated above) (year)

_____
(signed)
Chief Financial Officer

MINING AREA GRID



Natural Attributes:

Tree

Deer habitat

Rich top soil

Water

Beautiful vista

Conclusion Questions—answer the following in complete sentences:

1. Explain how the minerals were distributed throughout the cookie mines. Was this simulation, in regards to minerals, true to real life? Why or why not?

2. What did the mined cookie, before reclamation, represent? Use specific term

3. Did you leave any chips behind in your cookie? Why or why not?

4. Were you able restore the mined cookie to exactly its original size and topography? Why or why not?

5. Why do you think a "smudged" was analogous to acid mine drainage in this simulation?

6. Is the additional expense of mine reclamation necessary? Why or why not?

7. We put a monetary value on the rocks and minerals mined from the earth. Why is it difficult to put a price on the natural attributes and the ecological services they provide.– trees that provide oxygen, vistas that provide beautiful natural views, etc?

8. If we DID put a price on natural attributes and ecological services, what would that do to the consumer price of materials? Would this be a good or bad thing?

9. How would that affect the demand for non-renewable vs. renewable resources?

10. Describe an advantage of mining.

11. List 5 objects you use every day that contain some type of mineral (include the mineral. i.e. Pencil – Graphite)