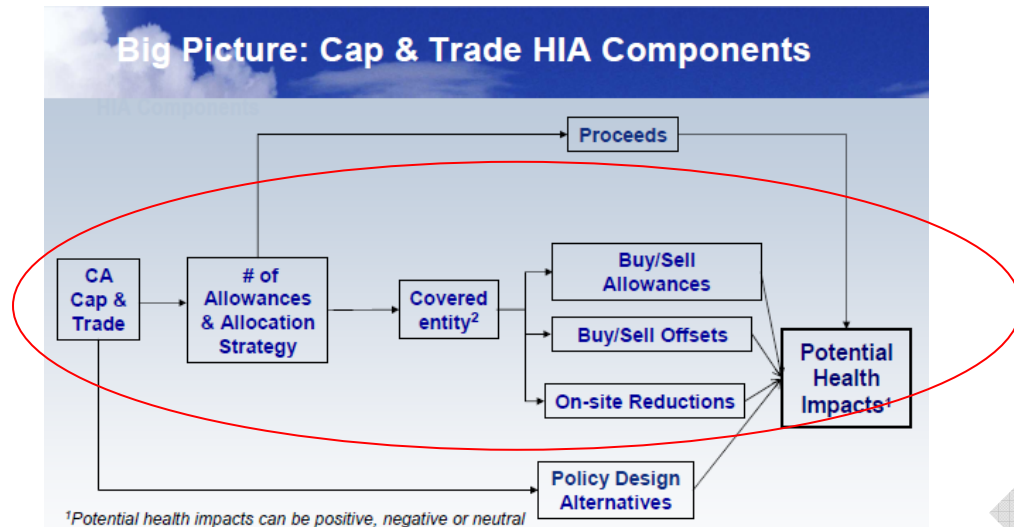


**Example Health Pathways for the Cap-and-Trade Health Impact Assessment (HIA) – Revised 2/4/2010 to reflect stakeholder comments.**



The HIA pathways discussed today will focus on the elements circled in red above.

The examples discussed today do not include the impacts of proceeds, which could change the potential health impacts described in each pathway.

The goal of our HIA analysis is to:

- (1) Describe potential health outcomes of the baseline case
- (2) Describe potential health outcomes with different policy design alternatives

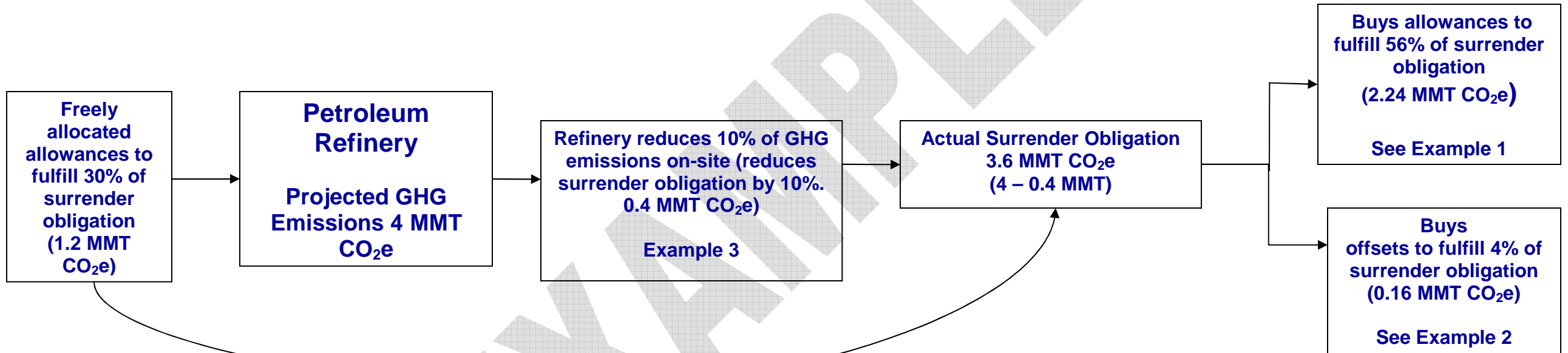
**Example HIA Pathway – Richmond Petroleum Refinery**

*Assumptions*

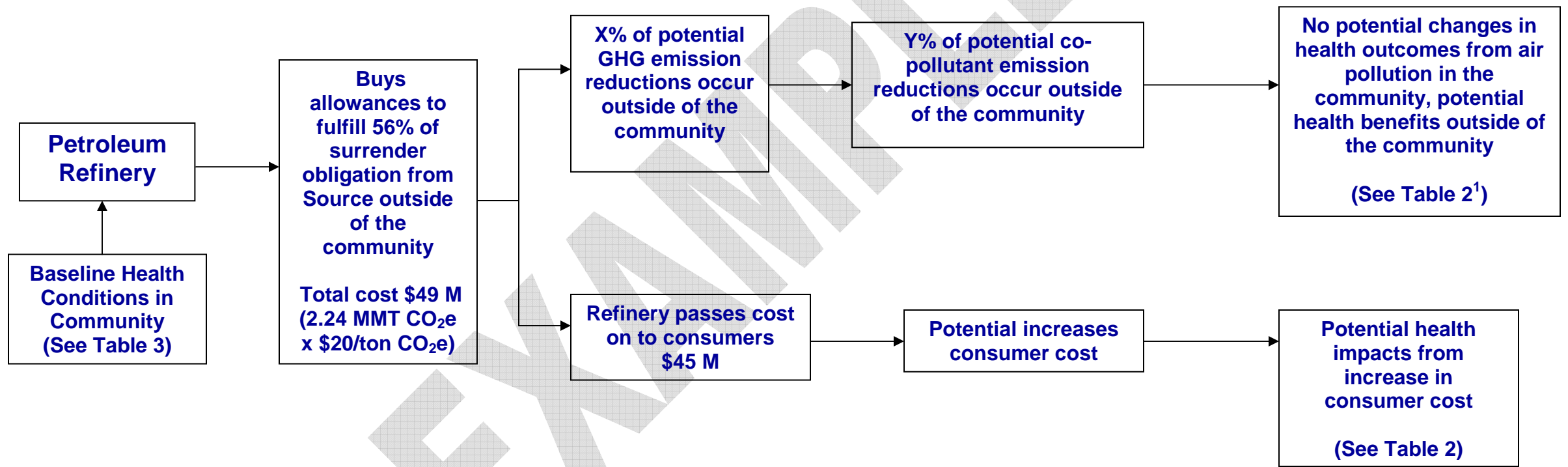
- Projected to emit 4 MMT CO<sub>2e</sub> in 2020
- Projected surrender obligation<sup>1</sup> is 4 million metric tons of carbon dioxide equivalent (MMT CO<sub>2e</sub>) via compliance instruments (allowances, offsets) OR reduce its greenhouse gas (GHG) emissions
- Actual surrender obligation is 3.6 MMT CO<sub>2e</sub> because the refinery reduced their emissions by 10 percent (0.4 MMT)

<sup>1</sup> An entities surrender obligation, i.e. that amount of compliance instruments (allowance and offsets) that an entity has to hand over at the end of each compliance period, is equivalent to their greenhouse gas emissions during the compliance period.

### OVERVIEW: RICHMOND PETROLEUM REFINERY SAMPLE HIA PATHWAY

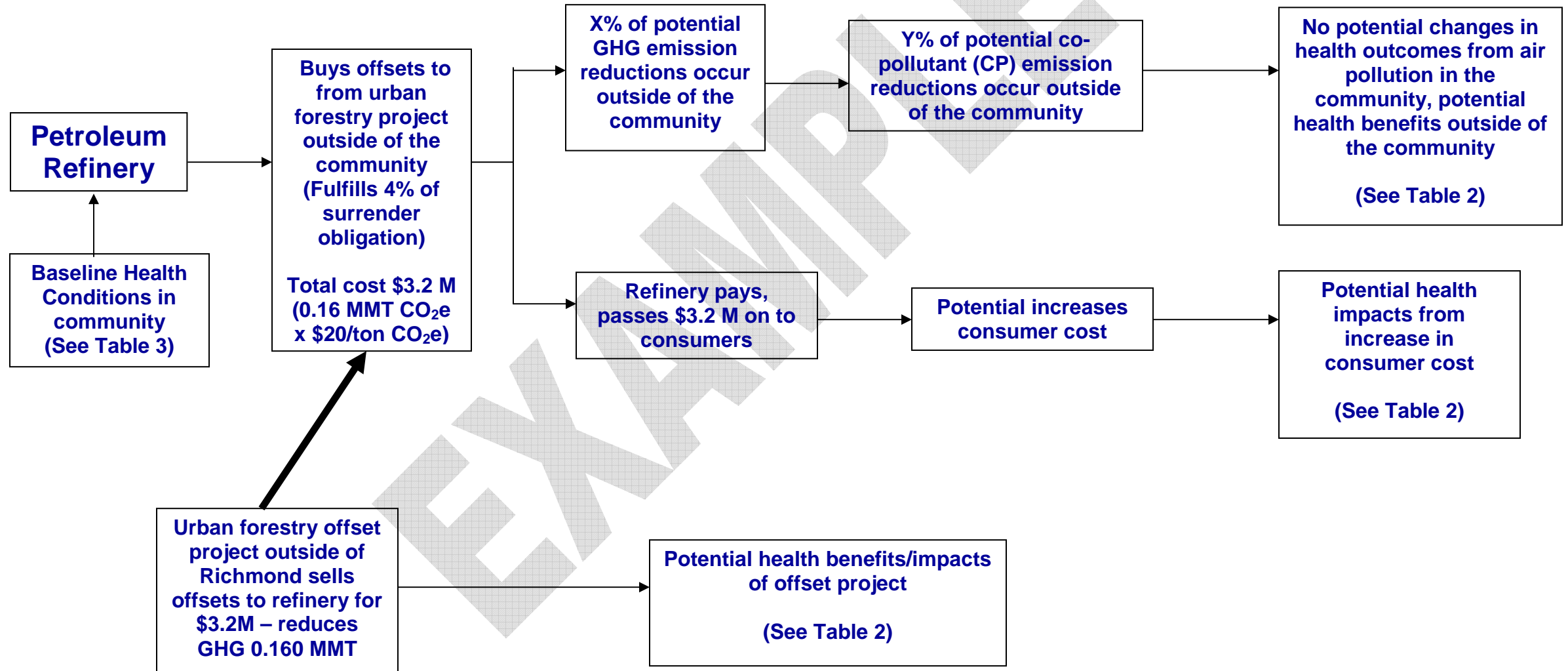


**EXAMPLE 1: ALLOWANCE TRADING – PETROLEUM REFINERY PURCHASES ALLOWANCES FROM A SOURCE OUTSIDE OF RICHMOND**

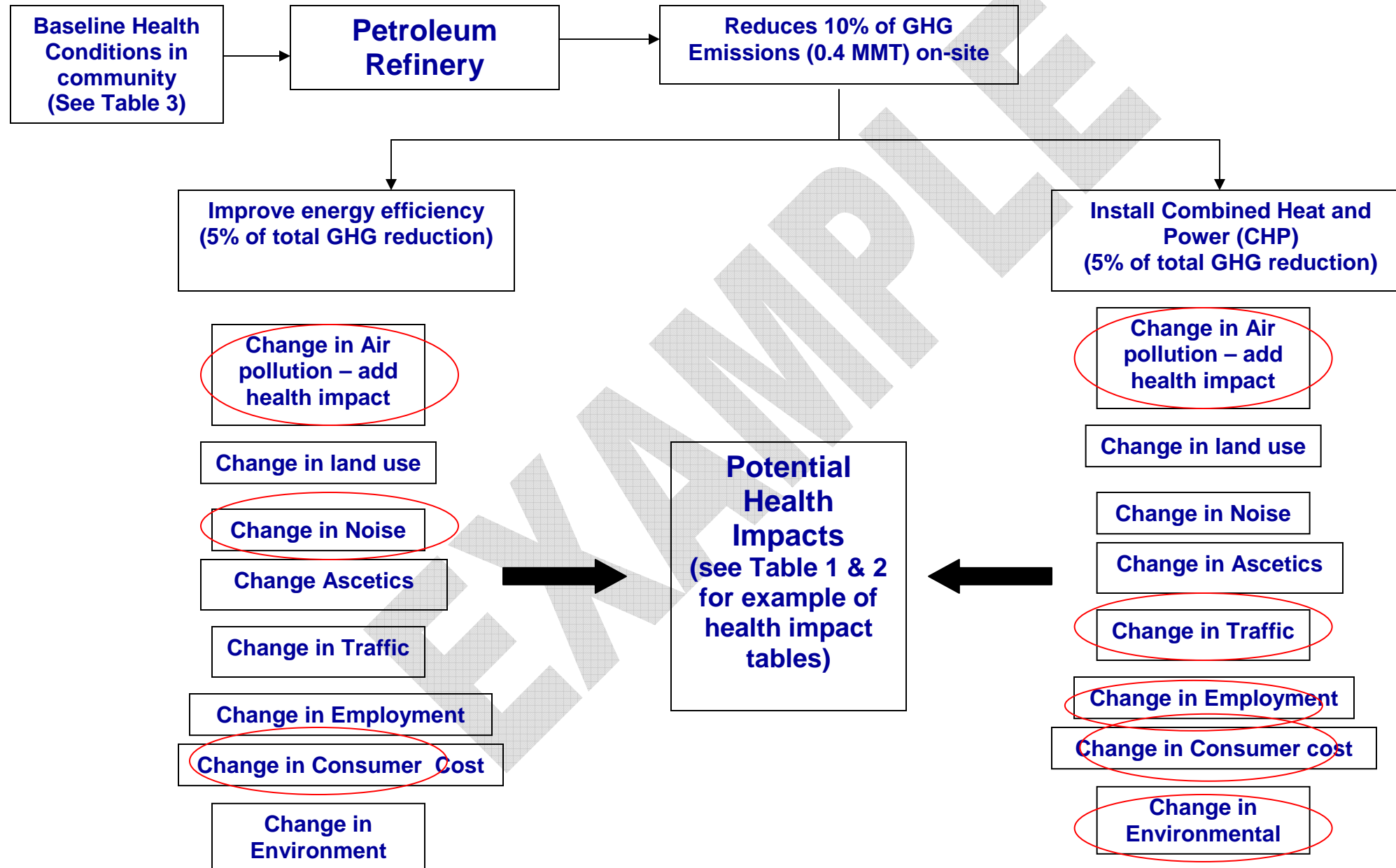


1. Please see Table 2 for a list of the potential health outcomes that could apply to this pathway.

## EXAMPLE 2: OFFSET TRADING – PETROLEUM REFINERY PURCHASES OFFSETS FROM A SOURCE OUTSIDE OF RICHMOND



### EXAMPLE 3: REDUCING GHG EMISSIONS ON-SITE



**Table 1. Potential Health Outcomes that could result from Installing Combined Health and Power (CHP)**

Process	Potential Effect	Potential Health Outcome	Judgment Magnitude <sup>1</sup>	Evidence Quality
<i>Combined Heat and Power</i>				
Replace existing boiler with a 50 MW Cogeneration system	Direct increase in GHG emissions but able to produce self-generate electricity and export energy to the power grid so net decrease in GHG. Reliable energy source reduces probability of polluting flares. CHP can reduce emissions of CO <sub>2</sub> , CO and NO <sub>x</sub> significantly compared to traditional power plants. If increasing refinery output, criteria pollutants will increase except for NO <sub>x</sub> . Increased localized emissions due to construction could last 1 year or longer	Influence respiratory symptoms & hospitalizations for heart and lung disease	* <i>to</i> ** (Either positive or negative)	Consistent quantitative evidence; supportive qualitative research
	Demolition and construction could results in an additional 18,000 truck trips on and off site increasing traffic and emissions. Additional employment will results in significant additional traffic.	Increased respiratory symptoms & hospitalizations for heart and lung disease; increased stress	- -	Consistent quantitative evidence; supportive qualitative research
	Large increase in employment by the communities largest employer, likely to last over 1 year or more	Increased job opportunities assist economic recovery; associated with improved health.	++	Consistent quantitative evidence; supportive qualitative research
	Very high initial cost. May take a couple of years to recoup costs through energy savings and these costs could be passed on to consumers	Can increase community stress if costs are passed on to consumer	-	Consistent quantitative evidence; supportive qualitative research
	Would more than double hazardous waste generation, but the new waste (solid spent catalyst) is much less hazardous than the waste being eliminated (liquid spent MEA with arsenic)	The consequences of a solid waste spill during transport would be less as the waste is less hazardous. The greatest risk of exposure is to employees.	-	Consistent quantitative evidence

<sup>1</sup> This column provides a scale of significance ranging from 0 – 3, where 0 = no impact and 3 = a significant impact. An effect is considered significant if it would affect a large number of people in the community and have the potential to create a serious adverse or potentially life threatening health outcome. Note air pollution effects can be regional and will impact more than the community.

Sources:

(1) CHEVRON ENERGY AND HYDROGEN RENEWAL PROJECT Draft Environmental Impact Report. State Clearinghouse No. 2005072117. City of Richmond Project No. 1101974. Volume 1. May 2007, <http://www.ci.richmond.ca.us/index.aspx?NID=832>,

(2) Industrial and Commercial Cogeneration. Washington, D.C. NTIS order #PB83-180547 Library of Congress Catalog Card Number 83-600702. . Office of Technology Assessment, February 1983 [http://www.princeton.edu/~ota/ns20/topic\\_f.html](http://www.princeton.edu/~ota/ns20/topic_f.html)(3) United States Environmental Protection Agency Combined Heat and Power Partnership Website at <http://www.epa.gov/chp/index.html>

**Table 2. SAMPLE Potential Health Impacts associated with Cap-and-Trade**

Potential Impact (change in...)	Potential Health Outcome	Judgment of Impact Magnitude <sup>1</sup>	Evidence Quality
Air Pollution emissions (criteria & toxics)	Respiratory symptoms and hospitalizations for heart and lung disease		
	Cardiovascular mortality		
	Asthma and lower respiratory symptoms		
	Acute bronchitis		
	Work loss days		
	Minor restricted activity days		
Consumer economic impact(s)			
	Diabetes		
	Obesity		
	Life expectancy		
	Heat-related illness/death		
	Cancer		
	Birth Outcomes		

<sup>1</sup>This column provides a scale of significance ranging from 0-3, where 0 = no impact and 3 = significant impact. An effect is considered somewhat significant if it would affect a large number of people in the community and have the potential to create a serious or potentially life threatening health outcome.

**Table 3: Baseline Health Conditions**

<b>Social Characteristics</b>	<b>Richmond</b>		<b>California</b>	
	Estimate	Percent	Estimate	Percent
Average household size	2.86	(X)	2.92	(X)
Average family size	3.49	(X)	3.53	(X)
Household population	96,965		35,556,575	
Population 25 years and over	64,404		23,237,728	
High school graduate or higher	(X)	79.3	(X)	80.3
Bachelor's degree or higher	(X)	25.7	(X)	29.4
Foreign born	31,317	31.5	9,855,606	27.1
Speak a language other than English at home (population 5 years and over)	42,348	45.9	14,292,655	42.4
<b>Economic Characteristics</b>	<b>Estimate</b>	<b>Percent</b>	<b>Estimate</b>	<b>Percent</b>
In labor force (population 16 years and over)	50,517	65.8	18,228,215	64.8
Mean travel time to work in minutes (workers 16 years and over)	31.9	(X)	27	(X)
Median household income (in 2008 inflation-adjusted dollars)	52,322	(X)	61,154	(X)
Median family income (in 2008 inflation-adjusted dollars)	59,557	(X)	69,659	(X)
Families below poverty level	(X)	12.3	(X)	9.6
Individuals below poverty level	(X)	14.9	(X)	12.9
<b>Housing Characteristics</b>	<b>Estimate</b>	<b>Percent</b>	<b>Estimate</b>	<b>Percent</b>
Total housing units	39,046		13,295,476	
Occupied housing units	33,901	86.8	12,177,852	91.6
Owner-occupied housing units	19,097	56.3	7,038,202	57.8
Renter-occupied housing units	14,804	43.7	5,139,650	42.2
Vacant housing units	5,145	13.2	1,117,624	8.4
Median house value (dollars)	461,200	(X)	510,200	(X)
<b>ACS Demographic Estimates</b>	<b>Estimate</b>	<b>Percent</b>	<b>Estimate</b>	<b>Percent</b>
Total population	99,318		36,418,499	
Male	47,949	48.3	18,210,090	50
Female	51,369	51.7	18,208,409	50
Median age (years)	34	(X)	34.7	(X)
Under 5 years	6,967	7	2,669,642	7.3
18 years and over	74,330	74.8	27,043,417	74.3
65 years and over	9,301	9.4	4,012,371	11
One race	96,857	97.5	35,162,860	96.6
White	35,914	36.2	22,189,514	60.9
Black or African American	28,274	28.5	2,250,630	6.2
American Indian and Alaska Native	127	0.1	285,162	0.8
Asian	14,849	15	4,471,394	12.3
Native Hawaiian and Other Pacific Islander	156	0.2	132,437	0.4
Some other race	17,537	17.7	5,833,723	16
Two or more races	2,461	2.5	1,255,639	3.4
Hispanic or Latino (of any race)	34,627	34.9	13,160,978	36.1
<b>Health Conditions 2006 (all rates per 100,000)</b>	<b>Estimate</b>	<b>Percent</b>	<b>Estimate</b>	<b>Percent</b>
Hospital admissions for all respiratory diseases	1257.6		679.1	
0 to 19 years	798.7		433.9	
20 to 64 years	697.5		329.3	
65 years and over	6375.7		3279.7	
Hospital admissions for asthma	216.5		87.6	
0 to 19 years	305.8		107.0	
20 to 64 years	133.4		59.1	
65 years and over	505.3		194.8	
Heart disease related mortality	303.1		178.3	
Hypertension related mortality	26.2		8.8	

Data Sources: United States Census 2006-2008 estimates,  
California Office of Statewide Health Planning and  
Development, CDPH Vital Statistics