Paper Calculator™
presented by environmental paper network

**Estimated environmental impacts were calculated using the Environmental Paper Network's Paper Calculator(tm). When used publicly, it is required that the information is properly cited as "Environmental impact estimates were calculated using the Environmental Paper Network Paper Calculator Version 4.0. For more information visit www.papercalculator.org".**

| | ECO SELF SEAL - 100% RECYCLED | ECO SELF SEAL - 100% VIRGIN |
|---|---|---|
| Paper Type: | Corrugated Container | Corrugated Container |
| Quantity: | 16666.9272 Pounds | 16666.9272 Pounds |
| % Recycled: | 100% | 0% |
|   | 0 U.S. short tons | 33.6 U.S. short tons<br>*33.6 U.S. short tons more* |
|   | 114 million BTUs | 219 million BTUs<br>*105 million BTUs more* |
|   | 35,900 pounds $CO_2$ equiv. | 141,000 pounds $CO_2$ equiv.<br>*105,100 pounds $CO_2$ equiv. more* |
|   | 99,300 gallons | 146,000 gallons<br>*46,700 gallons more* |
|   | 3,070 pounds | 3,420 pounds<br>*350 pounds more* |
| NITROGEN OXIDES ($NO_x$) | 8,250 $O_3$ equiv/$m^3$* | 4,880 $O_3$ equiv/$m^3$*<br>*3,370 less* |
| PURCHASED ENERGY | 114 million BTUs | 120 million BTUs<br>*6 million BTUs more* |
| PARTICULATES | 3,550 $PM_{2.5}$ equiv/$m^3$* | 1,780 $PM_{2.5}$ equiv/$m^3$*<br>*1,770 less* |
| SULFUR DIOXIDE ($SO_2$) | 35.7 pounds | 61.7 pounds<br>*26 pounds more* |
| VOLATILE ORGANIC COMPOUNDS (VOCs) | 0.6 pounds | 1.2 pounds<br>*0.6 pounds more* |
| TOTAL REDUCED SULFUR (TRS) | 0.9 pounds | 1.7 pounds<br>*0.9 pounds more* |
| HAZARDOUS AIR POLLUTANTS (HAPs) | 10.3 pounds | 17 pounds<br>*6.7 pounds more* |
| CHEMICAL OXYGEN DEMAND (COD) | 122 pounds | 194 pounds<br>*72 pounds more* |
| BIOCHEMICAL OXYGEN DEMAND (BOD) | 41.6 pounds | 60.5 pounds<br>*18.9 pounds more* |
| TOTAL SUSPENDED SOLIDS (TSS) | 33 pounds | 141 pounds<br>*108 pounds more* |
| FOREST DISTURBANCE | 0 acres | 6.09 acres<br>*6.09 acres more* |
| | | |

| | | |
|---|---|---|
| THREATENED SPECIES | 0 species | 9 species<br>*9 more* |
| OCEAN ACIDIFICATION | 10,000 pounds $H_2CO_3$ | 29,400 pounds $H_2CO_3$<br>*19,400 pounds more* |
| MERCURY EMISSIONS | 227 milligrams | 285 milligrams<br>*58 milligrams more* |
| DIOXIN EMISSIONS | 2,640 micrograms | 8,540 micrograms<br>*5,900 micrograms more* |
| FRESHWATER DISTURBANCE | See below | See below |
| HERBICIDES | See below | See below |
| OCEAN WARMING | See below | See below |
| WETLAND DISTURBANCE | See below | See below |

## Explanation of Data Values


**Wood use** measures the amount of wood required to produce a given amount of paper. Results are reported in fresh/green U.S. short tons of wood. The methodology does not include the forest residues left behind during pulpwood harvest in the forests (i.e., slash, roots). If forest residues were included it could be twice the number, as roughly 50% of biomass is left after harvest.

- ECO SELF SEAL - 100% recycled uses 0 U.S. short tons, made from about 0 trees
- ECO SELF SEAL - 100% virgin uses 33.6 U.S. short tons, made from about 201 trees

ECO SELF SEAL - 100% virgin uses 33.6 U.S. short tons more


**Total energy** measures all energy required over the paper's life cycle, including all renewable and nonrenewable resource use, including black liquor and all wood sources.

- ECO SELF SEAL - 100% recycled uses 114 million BTUs, equivalent to 135 residential refrigerators operated/year
- ECO SELF SEAL - 100% virgin uses 219 million BTUs, equivalent to 260 residential refrigerators operated/year

ECO SELF SEAL - 100% virgin uses 105 million BTUs more, a difference of 125 residential refrigerators operated/year


**Greenhouse gases/climate change impacts** measures carbon dioxide or $CO_2$ from burning fossil fuels, methane from paper decomposing in landfills and short-lived climate pollutants (such as black carbon and organic carbon) which contribute to climate change by trapping energy from the sun in the earth's atmosphere. This impact category also includes forest carbon storage loss from logged forests.

- ECO SELF SEAL - 100% recycled produces 35,900 pounds of $CO_2$ equiv., equivalent to 3.3 cars/year
- ECO SELF SEAL - 100% virgin produces 141,000 pounds of $CO_2$ equiv., equivalent to 12.8 cars/year

ECO SELF SEAL - 100% virgin produces 105,100 pounds $CO_2$ equiv. more, a difference of 9.5 cars/year


**Water consumption** measures the amount of process and cooling water that is consumed or degraded throughout the life cycle of the paper product.

- ECO SELF SEAL - 100% recycled uses 99,300 gallons, equivalent to 71.6 clothes washers operated/year
- ECO SELF SEAL - 100% virgin uses 146,000 gallons, equivalent to 105 clothes washers operated/year

ECO SELF SEAL - 100% virgin uses 46,700 gallons more, a difference of 33.4 clothes washers operated/year


**Solid waste** measures sludge and other wastes generated during pulp and paper manufacturing, and used paper disposed of in landfills and incinerators.

- ECO SELF SEAL - 100% recycled produces 3,070 pounds of solid waste, equivalent to 701 people generating solid waste/day
- ECO SELF SEAL - 100% virgin produces 3,420 pounds of solid waste, equivalent to 780 people generating solid waste/day

ECO SELF SEAL - 100% virgin produces 350 pounds more, a difference of 79 people generating solid waste/day

**Nitrogen oxides/ground level ozone** ($NO_x$, which includes NO and $NO_2$) measures products of the combustion of fuels that contain nitrogen. $NO_x$ can react with volatile organic compounds and sunlight in the lower atmosphere to form ozone, a key component of urban smog. $NO_x$ forms ozone and can also, in parallel, lead to acid rain. *The measurement of $NO_x$ in this calculator is a complex equation that takes into account human exposure across a sample of locations of pulp and paper mills. For more information please see the *Methodology* document under the Resources tab of this website (https://c.environmentalpaper.org/pdf/SCS-EPN-PC-Methods.pdf).

- ECO SELF SEAL - 100% recycled produces 8,250 persons x hrs. x pounds $O_3$ equiv/$m^3$, equivalent to 10.5 gasoline powered passenger cars/year
- ECO SELF SEAL - 100% virgin produces 4,880 persons x hrs. x pounds $O_3$ equiv/$m^3$, equivalent to 6.2 gasoline powered passenger cars/year
  ECO SELF SEAL - 100% virgin produces 3,370 persons x hrs. x pounds $O_3$ equiv/$m^3$ less, a difference of 4.3 gasoline powered passenger cars/year

**Purchased energy** is a subset of total energy, and measures how much energy comes from purchased electricity and other fuels.

- ECO SELF SEAL - 100% recycled uses 114 million BTUs, equivalent to 135 residential refrigerators operated/year
- ECO SELF SEAL - 100% virgin uses 120 million BTUs, equivalent to 143 residential refrigerators operated/year
  ECO SELF SEAL - 100% virgin uses 6 million BTUs more, a difference of 8 residential refrigerators operated/year

**Particulates/$PM_{2.5}$ impacts** measures the effect of particulate matter (PM) emissions from pulp/paper production, contributing to smog. Particulates are small airborne particles generated during combustion, and pose a range of health risks, including asthma and other respiratory problems, when inhaled. *The measurement of particulates in this calculator is a complex equation that takes into account human exposure across a sample of locations of pulp and paper mills. For more information please see the *Methodology* document under the Resources tab of this website (https://c.environmentalpaper.org/pdf/SCS-EPN-PC-Methods.pdf).

- ECO SELF SEAL - 100% recycled produces 3,550 persons x hrs. x pounds $PM_{2.5}$ equiv/$m^3$, equivalent to 134 gasoline powered passenger cars/year
- ECO SELF SEAL - 100% virgin produces 1,780 persons x hrs. x pounds $PM_{2.5}$ equiv/$m^3$, equivalent to 67.4 gasoline powered passenger cars/year
  ECO SELF SEAL - 100% virgin produces 1,770 persons x hrs. x pounds $PM_{2.5}$ equiv/$m^3$ less, a difference of 66.6 gasoline powered passenger cars/year

**Sulfur Dioxide ($SO_2$) and other acidifying emissions/regional acidification** measures chemical compounds such as sulfur dioxide, nitrogen oxides, and other acids (e.g. ammonia) that are produced when boilers burn fuel containing sulfur and other acid-producing substances. Of the fuels used in the paper industry, oil and coal generally contain the highest quantities of sulfur. These acidifying emissions contribute to air pollution problems like acid rain and smog. This category includes SO2 emissions, but also other acids and emissions like $NO_x$.

- ECO SELF SEAL - 100% recycled produces 35.7 pounds $SO_2$ equiv., equivalent to 11.6 eighteen-wheelers/year
- ECO SELF SEAL - 100% virgin produces 61.7 pounds $SO_2$ equiv., equivalent to 20 eighteen-wheelers/year
  ECO SELF SEAL - 100% virgin produces 26 pounds $SO_2$ equiv. more, a difference of 8.4 eighteen-wheelers/year

**Volatile organic compounds (VOCs)** measure a broad class of organic gases, such as vapors from solvent and gasoline. VOCs react with nitrogen oxides ($NO_x$) in the atmosphere to form ground-level ozone, the major component of smog and a severe lung irritant.

- ECO SELF SEAL - 100% recycled produces 0.6 pounds, equivalent to 2,710 miles driven in a car/year
- ECO SELF SEAL - 100% virgin produces 1.2 pounds, equivalent to 5,160 miles driven in a car/year
  ECO SELF SEAL - 100% virgin produces 0.6 pounds more, a difference of 2,450 miles driven in a car/year

**Total reduced sulfur (TRS)** measures emissions of the compounds that cause the odor associated with kraft pulp mills. Exposure to TRS emissions has been linked to symptoms including headaches, watery eyes, nasal problems, and breathing difficulties.

- ECO SELF SEAL - 100% recycled produces 0.9 pounds
- ECO SELF SEAL - 100% virgin produces 1.7 pounds
  ECO SELF SEAL - 100% virgin produces 0.9 pounds more

**Hazardous air pollutants (HAPs)** measures any of a group of 188 substances identified in the 1990 U.S. Clean Air Act

amendments because of their toxicity. Two of the most common occurring in air are formaldehyde and acrolein.

- ECO SELF SEAL - 100% recycled produces 10.3 pounds, equivalent to 2.06 passenger cars/year
- ECO SELF SEAL - 100% virgin produces 17 pounds, equivalent to 3.4 passenger cars/year
  ECO SELF SEAL - 100% virgin produces 6.7 pounds more, a difference of 1.3 passenger cars/year

**Chemical oxygen demand (COD)** measures the amount of oxidizable organic matter in the mill's effluent. Since wastewater treatment removes most of the organic material that would be degraded naturally in the receiving waters, the COD of the final effluent provides information about the quantity of more persistent substances discharged into the receiving water.

- ECO SELF SEAL - 100% recycled produces 122 pounds COD, equivalent to 0.7 homes/year
- ECO SELF SEAL - 100% virgin produces 194 pounds COD, equivalent to 1.2 homes/year
  ECO SELF SEAL - 100% virgin produces 72 pounds more, a difference of 0.4 homes/year

**Biochemical oxygen demand (BOD)** measures the amount of oxygen that microorganisms consume to degrade the organic material in the wastewater. Discharging wastewater with high levels of BOD can result in oxygen depletion in the receiving waters, which can adversely affect fish and other organisms.

- ECO SELF SEAL - 100% recycled produces 41.6 pounds BOD, equivalent to 0.2 homes/year
- ECO SELF SEAL - 100% virgin produces 60.5 pounds BOD, equivalent to 0.3 homes/year
  ECO SELF SEAL - 100% virgin produces 18.9 pounds more, a difference of 0.1 homes/year

**Total Suspended Solids (TSS)/Freshwater eutrophication** measures solid materials suspended in mill effluent, which can adversely affect bottom-living organisms upon settling in receiving waters and can carry toxic heavy metals and organic compounds into the environment.

- ECO SELF SEAL - 100% recycled produces 33 pounds TSS, equivalent to 0.2 homes/year
- ECO SELF SEAL - 100% virgin produces 141 pounds TSS, equivalent to 0.7 homes/year
  ECO SELF SEAL - 100% virgin produces 108 pounds more, a difference of 0.5 homes/year

**Forest disturbance** measures the impact of paper production on forest ecosystems and biodiversity. The indicator compares the ecosystem integrity of a harvested site to intact forests over 80 years old in the region, using on-the-ground measurements. It also considers the recovery potential which would be possible on the site if harvesting were halted, reflecting the long-term implication of forest management at suppressing ecosystem integrity.

- ECO SELF SEAL - 100% recycled disturbs 0 acres, equivalent to the size of 0 football fields
- ECO SELF SEAL - 100% virgin disturbs 6.09 acres, equivalent to the size of 4.6 football fields
  ECO SELF SEAL - 100% virgin uses 6.09 acres more

**Threatened species** measures the possible number of species affected by logging for paper production in the North American region that are listed as Critically Endangered, Endangered, or Vulnerable in the IUCN Red List of Threatened Species (http://www.iucnredlist.org), though the exact impact will vary by forest of origin. The number of species is based on correlation with logging threats assessed by IUCN and the fiber basket of pulp and paper mills in the region. For more information see the Methodology Document (https://c.environmentalpaper.org/pdf/SCS-EPN-PC-Methods.pdf).

- ECO SELF SEAL - 100% recycled impacts 0 species
- ECO SELF SEAL - 100% virgin impacts 9 species
  ECO SELF SEAL - 100% virgin impacts 9 more

**Ocean acidification** measures increased ocean acidity caused by $CO_2$, which has detrimental consequences for many marine organisms. This indicator considers $CO_2$ emitted during the production of pulp and paper, but also evaluates the amount of $CO_2$ that could be sequestered in trees if forest harvests used for papermaking were halted.

- ECO SELF SEAL - 100% recycled produces 10,000 pounds $H_2CO_3$, equivalent to 2.6 cars/year
- ECO SELF SEAL - 100% virgin produces 29,400 pounds $H_2CO_3$, equivalent to 7.6 cars/year
  ECO SELF SEAL - 100% virgin produces 19,400 pounds $H_2CO_3$ more, a difference of 5.0 cars/year

**Mercury emissions** measure the amount of emissions during the production of pulp and paper. Mercury is a very toxic substance that persists in the environment for long periods of time. Emissions can therefore lead to contamination in the environment, including freshwater bodies and oceanic systems, subsequently exposing flora and fauna to elevated concentrations.

- ECO SELF SEAL - 100% recycled produces 227 milligrams, equivalent to 56.8 compact fluorescent lights
- ECO SELF SEAL - 100% virgin produces 285 milligrams, equivalent to 71.1 compact fluorescent lights
  ECO SELF SEAL - 100% virgin produces 58 milligrams more, a difference of 14.3 compact fluorescent lights

**Dioxin emissions** measure the amount of dioxin emissions that are released to air and water from pulp and paper mills. Dioxins are persistent and bioaccumulative, and even small amounts of emission can contaminate local waterways and bioaccumulate in fish.

- ECO SELF SEAL - 100% recycled produces 2,640 micrograms
- ECO SELF SEAL - 100% virgin produces 8,540 micrograms
  ECO SELF SEAL - 100% virgin produces 5,900 micrograms more

**Freshwater disturbance** measures the number of freshwater systems possibly affected by logging. Logging can impact streams, rivers and creeks by increasing erosion, removing riverside vegetation and removing large woody debris that many fish species require for habitat. Although this impact is important and relevant, no data is currently available to calculate results. Reflecting the critical nature of this impact category, it is reported here as relevant to pulp/paper production, although results cannot be evaluated at this time.

**Herbicides** measures the amount of toxic herbicides used in growing trees for paper production. Herbicides are applied to control the spread of non-desirable species. Although this impact is important and relevant, no data is currently available to calculate results. Reflecting the critical nature of this impact category, it is reported as relevant to pulp/paper production, although results cannot be evaluated at this time.

**Ocean warming** measures increased ocean temperatures linked to emissions of greenhouse gases. Although this impact is important and relevant to emissions and foregone growth from logging, no algorithm is currently available to calculate results. Reflecting the critical nature of this impact category, it is reported as relevant to pulp/paper production, although results cannot be evaluated at this time.

**Wetland disturbance** measures the acreage of wetlands possibly affected by logging. Logging can increase erosion, which will cause changes in the sediment, temperature and other characteristics of wetlands. Although this impact is important and relevant, no data is currently available to calculate results. Reflecting the critical nature of this impact category, it is reported as relevant to pulp/paper production, although results cannot be evaluated at this time.

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If you have questions or would like more information about Paper Calculator V4.0, please see the Life Cycle Assessment Methodology document under the "Resources" tab of this website (https://c.environmentalpaper.org/resources.html) or contact us at info@environmentalpaper.org.

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