

**Blasting Quarry Operations: Land Use Compatibility Issues and Potential  
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- Bajpayee, T. S., Rehak, T. R., Mowrey, G. L. and Ingram, D. K., "Blasting injuries in surface mining with emphasis on flyrock and blast area security", 2004, 35(1) Saf. Res. 47-57
- Balakrishnan, V. and Rai, P., "An Overview of Flyrock and its Prediction in Surface Mine Blasting using Soft Computing Techniques," (2021) 2 (2) Recep Tayyip Erdogan University Journal of Science and Engineering 105-119, <<https://dergipark.org.tr/en/download/article-file/1941187>>
- 1) Baliktisis, E.K., "Blasting vibration limits to prevent human annoyance remarks from some case studies", (2001) 10 (1) Mineral Resources Engineering 71-81
- Biddle Jr Nicholas, "Forum: National anti-quarry 'tea party' blasting across Web", <<https://www.sandiegouniontribune.com/sdut-forum-national-anti-quarry-tea-party-blasting-2009oct18-story.html>>
- Blanchier, A., "Quantification of the levels of risk of flyrock," Rock Fragmentation by Blasting: The 10<sup>th</sup> International Symposium on Rock Fragmentation by Blasting, 2012 (Fragblast 10), Leiden: 549-553.
- Carl E Campbell, "Kentucky Energy and Environment Cabinet Department for Natural Resources, Reclamation Advisory Memorandum RAM #140, July 18, 2008, <<https://eec.ky.gov/Natural-Resources/Mining/Mine-Permits/RAMS/RAM140.pdf>>
- Davies, P. A., "Risk based approach to setting of flyrock danger zones for blasting sites," May–August 1995, Trans. Inst. Mines Met. 96–100
- 2) Demos Binder, "The Duty to disclose Geologic Hazards in Real Estate Transactions," (1998) 1 (13) Chapman Law Review 13-56, <[https://www.chapman.edu/law/\\_files/publications/CLR-1-denis-binder.pdf](https://www.chapman.edu/law/_files/publications/CLR-1-denis-binder.pdf)>.
- 3) Dennis B Guignet, "What Do Property Values Really Tell Us? Evidence From Revealed and Stated Preference Studies," Doctoral dissertation University of Maryland, College Park, 2011
- Department of State Development, *Resource Area Management and Planning Final Report*, July 2014, <[https://energymining.sa.gov.au/\\_\\_data/assets/pdf\\_file/0020/240662/2014-07-22\\_DSD\\_Resource\\_Area\\_Management\\_and\\_Planning.pdf](https://energymining.sa.gov.au/__data/assets/pdf_file/0020/240662/2014-07-22_DSD_Resource_Area_Management_and_Planning.pdf)>
- 4) Diane Hite and Derrick Robinson, "The Impact of Hard Rock and Gravel Mines on House Prices in Upstate New York", June 23, 2015
- Edy T Mohamad, Chang S Yi, Bhatawdekar Murlidhar, Rosli Saad, "Abstract: Effect of Geological Structure on Flyrock Prediction in Construction Blasting," (2018) 4 Geotechnical and Geological Engineering
- 5) Emil Malikov, Yiguo Sun and Diane Hite, "(Under)Mining Local Residential Property Values: A Semiparametric Spatial Quantile Autoregression," (June 22, 2018) Journal of Applied Econometrics 82-109, <<https://onlinelibrary.wiley.com/doi/epdf/10.1002/jae.2655>>

**Blasting Quarry Operations: Land Use Compatibility Issues and Potential Property Value Impacts**

- ⑥ Erickcek, G., "An Assessment of the Economic Impact of the Proposed Stoneco Gravel Mine Operation on Richland Township," *W.E. Upjohn Institute*, 2006, <<https://research.upjohn.org/cgi/viewcontent.cgi?referer=>>
- ① Eugene F Brigham, "The Determinants of Residential Land Values" (1965) 41 *Land Economics* 325
- Fischenich, M., "Expert: Flyrock from any blast 'unacceptable', (Oct 21, 2017) *The Free Press*, <[https://www.mankatofreepress.com/news/local\\_news/expert-flyrock-from-any-blast-unacceptable/article\\_8ad31cf8-b5cf-11e7-bf58-c3cdd328cf7f.html](https://www.mankatofreepress.com/news/local_news/expert-flyrock-from-any-blast-unacceptable/article_8ad31cf8-b5cf-11e7-bf58-c3cdd328cf7f.html)>
- Frank, R., "Deal struck in lawsuit over land disturbance near quarry," *forsythnews.com*, March 25, 2009, <<https://www.forsythnews.com/local/local-government/deal-struck-in-lawsuit-over-land-disturbance-near-quarry/>>
- ⑧ Freda Harris and Will Collette, "*The People's Guide to Blasting: How to Protect Your Home, Family and the Environment*," 1999, <[https://www.crmw.net/files/Blasting\\_Summary.pdf](https://www.crmw.net/files/Blasting_Summary.pdf)>
- Frederick Law Olmsted, "Public Parks and the Enlargement of Towns" in *American Social Science Association* 1870 (reprinted: Michael Larice & Elizabeth Macdonald, eds, *The Urban Design Reader*, 2d ed [New York: Routledge, 2013] 36)
- Gardiner, S. M., "A core precautionary principle." (2006) 14 (1) *The Journal of Political Philosophy* 33-60. <<https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1467-9760.2006.00237.x>>
- ⑨ George S. Tolley, *Effects of the Proposed Indeck Facility on Property Values, Land Use and Tax Revenues*. May 2000, unpublished paper, page 6
- Hasel Amini, Raof Gholami, Masoud Monjezi, Seyed R Torabi and Jamal Zadhesh, "Evaluation of flyrock phenomenon due to blasting operation by support vector machine," (2011) *Neural Computing & Applications*, <[https://www.researchgate.net/publication/241039190\\_Evaluation\\_of\\_flyrock\\_phenomenon\\_due\\_to\\_blasting\\_operation\\_by\\_support\\_vector\\_machine](https://www.researchgate.net/publication/241039190_Evaluation_of_flyrock_phenomenon_due_to_blasting_operation_by_support_vector_machine)>
- Henry L Alder and Edward B Roessler, *Introduction to Probability and Statistics*, Third Edition (W.H. Freeman and Company, 1964)
- Hite, Diane, "Information and Bargaining in Markets for Environmental Quality," (1998) 74 (3) *Land Economics* 303-316
- Hobart M. King, 'Abandoned Mine and Quarry Accidents Claim Several Lives per Year', *Geology.com*, n.d., <<https://geology.com/articles/abandoned-mines.shtml>>
- James T. Ludwiczak, *The Blasting Primer*, Second Edition (International Society of Explosives Engineers, 2002)

**Blasting Quarry Operations: Land Use Compatibility Issues and Potential Property Value Impacts**

- 10 Jauregui, A. and Diane Hite, "The Impact of Realtors on House Prices near Environmental Disamenities", (2009) 20 (2) Housing Policy Debate 295-316
- Jeff Loeb and Dwayne D Tannant, "Urban Construction Blasting in Canada - Complaints and Associated Municipal Bylaws," (2014) 2 (1) Civil Engineering Architecture, 1-10, <<https://www.hrpub.org/download/20131215/CEA1-14801317.pdf>>
- 11 Jefferson M Domingues, Vania F L Miranda, Denise C Rezende, Yar S Lares, "Statistical Modeling of Quarrying Activities and Their Impact on Residents' Satisfaction," (2020) 3 (2) Journal of Environmental Science and Sustainable Development 416-429. <<https://scholarhub.ui.ac.id/cgi/viewcontent.cgi?article=1062&context=jessd>>
- Joffre Castro, et al., "Investigation of Ground-Water Problems Near Vulcan Materials Marble Quarry, Cherokee County," South Carolina, Hydrology - Open-File Report 19, <[https://hydrology.dnr.sc.gov/pdfs/reports/SCWRC\\_Open-File\\_Report\\_19.pdf](https://hydrology.dnr.sc.gov/pdfs/reports/SCWRC_Open-File_Report_19.pdf)>
- Josh Cabel, "NIOSH Offers Tips for Flyrock Safety," (January 25, 2007) EHS Today, <<https://www.ehstoday.com/construction/article/21911356/niosh-offers-tips-for-flyrock-safety>>
- Kecojevic, V. and Radomsky, M., "Flyrock phenomena and area security in blasting-related accidents", (2005) 43(9) Saf. Sci. 739-750
- 12 Ken Ward Jr., "Buying Blair: Arch Coal found way to move residents away", (Oct 25, 2017) Charleston Gazette-Mail, Updated, <[https://www.wvgazettemail.com/news/special\\_reports/buying-blair-arch-coal-found-way-to-move-residents-away/article\\_c9999d45-538b-56cb-9300-aa5894c048cf.html](https://www.wvgazettemail.com/news/special_reports/buying-blair-arch-coal-found-way-to-move-residents-away/article_c9999d45-538b-56cb-9300-aa5894c048cf.html)>
- Ken Ward Jr., "Have a blast: OSM finds WVDEP lax in policing flyrock," (August 17, 2009) Clarkson Gazette-Mail, <<http://blogs.wvgazettemail.com/coaltattoo/2009/08/17/have-a-blast-osm-finds-wvdep-lax-in-policing-flyrock/>>
- 13 Kolala, C., Polyakov, M., Fogarty, J. "Impacts of mining on property values in Kalgoorlie\_Boulder, Western Australia," (2020) 68(C) Resources Policy
- Little, T. N., "Flyrock risk". In Proceedings of EXPLO Conference, Wollongong, NSW, 3-4 September 2007, pp. 35-43, <<https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=EXH-2570%2120191217T043417.551%20GMT>>
- Loeb, Jeffrey Thomas, "Regulatory mitigation of the adverse environmental effects of urban blasting," Thesis, 2012, University of British Columbia <<https://open.library.ubc.ca/cIRcle/collections/ubctheses/24/items/1.0050876#downloadfiles>>

**Blasting Quarry Operations: Land Use Compatibility Issues and Potential Property Value Impacts**

- Ludwiczak, James T., *The Blasting Primer, Second Edition* (Blasting and Mining Consultants, Rogers Printing Group, 2002)
- Lwin, M Min and Aung, Z Moon, "Prediction and Controlling Flyrock due to Blasting for Kyaukpahto Gold Mine," (2019) 5 (10) International Journal of Advances in Scientific Research and Engineering, <<https://pdfs.semanticscholar.org/1eb3/a776fa7caf6ff4697c85a112424b875770e6.pdf>>.
- Mark L Dorfman, "Proposed Land Use Compatibility Guideline Ministry of Environment, Conservation and Parks (MECP)", report addressed to the Township of Ramara Committee of the Whole, June 21, 2021, <[https://www.northkawartha.ca/en/our-council/resources/09-07-Council-Package/CA\\_5\\_c\\_Mark-L.-Dorfman-Planner-Inc.\\_Redacted.pdf](https://www.northkawartha.ca/en/our-council/resources/09-07-Council-Package/CA_5_c_Mark-L.-Dorfman-Planner-Inc._Redacted.pdf)>
- Mark R. Svinkin, "Drawbacks of Blast Vibration Regulations," (2004) VibraConsult, <<https://vulcanhammernet.files.wordpress.com/2017/01/blst-crt.pdf>> Retrieved on April 23, 2022
- MESA, 'Magazine of Mining Health and Safety, United States Department of the Interior', (December/January 2021) 2 (6) MESA Magazine, <<https://play.google.com/books/reader?id=SwNI7rxA5ugC&hl=en&pg=GBS.PA1>>
- 14 Mining Watch, "Largest Gold Mine in Canada Settles with Affected Citizens Out of Court," (October 15, 2019) Mining Watch
- Mishra, A. K. and Mallick, D. K., "Analysis of blasting related accidents with emphasis on flyrock and its mitigation in surface mines", In *Rock Fragmentation by Blasting* (eds Singh, P. K. and Sinha, A.), Taylor and Francis, London, 2013, pp. 555-561
- Mishra, A. K. and Rout, M., "Flyrocks - Detection and Mitigation at Construction Site in Blasting Operation," (2011) 1(1) World Environment 1-5
- Mpofu, M. et al., "The influence of stemming practice on ground vibration and air blast," (2021) 121 *The Journal of Southern African Institute of Mining and Metallurgy* 1-9, <<https://www.saimm.co.za/Journal/v121n01p1.pdf>>
- 14 NCHRP 25-25/Task 72, Current Practices to Address Construction Vibration and Potential Effects to Historic Buildings Adjacent to Transportation Projects, Wilson, Ihrig & Associates, Inc., ICF International, and Simpson, Gumpertz & Heger, Inc., September 2012, <[https://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP25-25\(72\)\\_FR.pdf](https://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP25-25(72)_FR.pdf)>.
- 15 Neelawala, P., Wilson C. and Robinson, T., "What impact does an announcement of a quarry road have on property values? Evidence from Queensland Australia," paper presented at the 85<sup>th</sup> Annual Conference of Western Economic Association International, 29 June - 03 July 2010

**Blasting Quarry Operations: Land Use Compatibility Issues and Potential  
Property Value Impacts**

- 16) Neelawala, S.N.S.L.H.P., "Asymmetric Information Between Buyers and Sellers in the Residential Property Market, A Hedonic Property Valuation Approach," PhD diss. Queensland University of Technology, 2014, <<https://eprints.qut.edu.au/76412/5/S.N.S.L.H.P%20Neelawala%20Thesis.pdf>>
- Queensland Government Explosives Inspectorate, "Significant explosives accidents and incidents," for 2008, <[https://www.rshq.qld.gov.au/\\_\\_data/assets/pdf\\_file/0013/1512040/significant-incident-reports-2008.pdf](https://www.rshq.qld.gov.au/__data/assets/pdf_file/0013/1512040/significant-incident-reports-2008.pdf)>
- 17) Quesne, J.D., 'Blasting vibration from limestone quarries and their effect on concrete block and Stucco homes', (2001) Vibration Problem. Geo-Discussion Forum
- R: Core Team, "R: a language and environment for statistical computing", (2019) Foundation for Statistical Computing, Vienna, Austria. <<https://www.R-project.org/>>
- Raina, A. K., Murthy, V. M. S. R. and Soni, A. K., "Flyrock in surface mine blasting: understanding the basics to develop predictive regime," (2015) 108 (4) Current Science 25, <<https://www.currentscience.ac.in/Volumes/108/04/0660.pdf>>
- Raina, A. K., Soni, A. K. and Murthy, V. M. S. R., "Spatial distribution of flyrock using EDA: An insight from concrete model tests. In Rock Fragmentation by Blasting (eds Singh, P. K. and Sinha, A.)," Taylor and Francis, London, 2013, pp. 563-570
- Rathore, S.S. and Jain, E.S.C., "Studies on flyrock at soapstone quarry for safe working," 2007 Vienna Conference Proceedings 2007, European Federation of Explosives Engineers
- Rathore, S. S. and Jain, E.S.C., "Studies on flyrock at soapstone quarry for safe working," (2007) Vienna Conference Proceedings 2007, European Federation of Explosives Engineers, ISBN 978-09550290-1-1
- Richard J Mainiero, Marcia L Harris, and James H Rowland III, "Dangers of Toxic Fumes from Blasting," 33<sup>rd</sup> Annual Conference on Explosives and Blasting Technique, Nashville, TN, ISEE, 2007; 1: 1-6, <<https://www.cdc.gov/niosh/mining/UserFiles/works/pdfs/dotff.pdf>> Retrieved on September 24, 2022
- Rosen, S., "Hedonic prices and implicit markets: product differentiation in pure competition", (1974) 82 (1) J. Polit. Econ. 34-55
- Samad Uthman, "Into the 'cracks' Land (1): RCC Blasts Rocks for Lagos-Ibadan Road Construction, But Ogunmakin Suffers the Injury," (November 12, 2021) Dataphyte, <<https://www.dataphyte.com/latest-reports/climate/into-the-cracks-land-1-rcc-blasts-rocks-for-lagos-ibadan-road-construction-but-ogunmakin-suffers-the-injury/>>
- 18) Sayed-Ahmed, E. Y. and Naji, K. K., "Residential Houses Cracking Due to Nearby Subsurface Construction Blasting: Critical Review of Current

**Blasting Quarry Operations: Land Use Compatibility Issues and Potential  
Property Value Impacts**

Safe Limits", Civil Engineering Department, University of Qatar, Doha, Qatar, 1<sup>st</sup> International Structural Specialty Conference, Calgary, Alberta, Canada, Mar 23-26, 2006, <[https://www.researchgate.net/publication/280530625\\_Residential\\_Houses\\_Cracking\\_Due\\_to\\_Nearby\\_Subsurface\\_Construction\\_Blasting\\_Critical\\_Review\\_of\\_Current\\_Safe\\_Limits](https://www.researchgate.net/publication/280530625_Residential_Houses_Cracking_Due_to_Nearby_Subsurface_Construction_Blasting_Critical_Review_of_Current_Safe_Limits)>

Sir Ebenezer Howard, *Garden Cities of To-Morrow* (Cambridge: MIT Press, [1902] 1965)

(19)

Siskind, D. E., Stagg, M. S., Kopp, J. W. and Dowding, C. H., "Report of Investigations 8507: Structure Response and Damage Produced by Ground Vibration from Surface Mine Blasting," (1980), prepared for US Bureau of Mines, <<http://www.osmre.gov/resources/blasting/docs/USBM/RI8507BlastingVibration1989.pdf>> [RI 8507]

Taylor, A., *The Application of the Precautionary Principle in the Land Use Planning Process* [Unpublished master's thesis]. Queen's University, 2015, <<https://qspace.library.queensu.ca/jspui/handle/1974/14419>>

(20)

Tom Mitchell, "Quarry blast sends slate pieces into nearby yards," *Rutland Herald*, October 17, 2018, <[https://www.rutlandherald.com/news/quarry-blast-sends-slate-pieces-into-nearby-yards/article\\_258669ca-9aa6-566b-9ca3-e21dab8328d1.html](https://www.rutlandherald.com/news/quarry-blast-sends-slate-pieces-into-nearby-yards/article_258669ca-9aa6-566b-9ca3-e21dab8328d1.html)>

Tony Sevelka, "Preventing the Potentially Deadly Consequences of Flyrock: Mandatory Minimum Setbacks Required (Revised 31-Oct-2021)." Research paper submitted as part of Witness Statement of Bill Hill, an explosives engineer, at the Ontario Land Tribunal (OLT) hearing of *Fowler Construction Company Ltd. v. Ramara Township*, March 2022 (Case No: PL190391)

US Bureau of Mines RI 8507, "Structural Response and Damage Produced by Ground Vibration From Surface Mine Blasting," 1980. <<https://vibrationmonitoringcourse.com/wp-content/uploads/sites/7/2014/03/RI-8507-Blasting-Vibration-1989-Org-Scanned-Doc.pdf>>

van der Walt and Spiteri, W., "A critical analysis of recent research into the prediction of flyrock and related issues resulting from surface blasting activities," (2020) 120 (12) *Journal of the Southern African Institute of Mining and Metallurgy* 701-714, <<http://dx.doi.org/10.17159/2411-9717/1103/2020>>, <<https://www.saimm.co.za/Journal/v120n12p701.pdf>>.

Verakis, H. and Lobb, T., "Flyrock revisited an ever present danger in mine blasting," (2007), <<http://dpcs/osee/prg/ISEE/Support/Proceed/General/07GENVI/07v109g.pdf>>

Verakis, H. and Lobb, T., "Flyrock revisited an ever-present danger in mine blasting," 2007

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Property Value Impacts**

<<http://docs.isee.org/ISEE/Support/Proceed/General/07GENV1/07v109g.pdf>>

Verakis, H., "Flyrock: a continuing blast safety threat", (2011),  
<<http://docs.isee.org/ISEE/Support/Proceed/General/IIGENVI/11v161g/pdf>>

Winfield, Mark S. and Taylor, "Rebalancing the load: The need for an  
aggregates conservation strategy for Ontario," *The Pembina Institute*,  
January 25, 2005,  
<<https://www.pembina.org/reports/Aggregatesfinal-web2.pdf>>

Zhou, Z., Li, X., Liu, X., Wan, G., "Safety Evaluation of Blasting Flyrock Risk  
with FTA Method," *School of Resources and Safety Engineering, Central  
South University, Changsha 410083, Hu'nan, China*,  
<<https://miningandblasting.files.wordpress.com/2009/09/safety-evaluation-of-blasting-flyrock-risk-with-fta-method.pdf>>

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### AUTHOR'S DECLARATION AND ESSENTIAL ETHICAL COMPLIANCES

#### *Authors' Contributions (in accordance with ICMJE criteria for authorship)*

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#### *Research involving human bodies (Helsinki Declaration)*

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