Critical Review of Certain Aspects
of the BILCON of Nova Scotia Corporation
Whites Point Quarry and Marine Terminal
Environmental Impact Statement (EIS)
Volume IV, Section 9

Compiled at the request of the Sierra Club Canada (J.M. Eaton and M. Dittrick)

by

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General
• There is a huge literature relevant to the aquatic sciences in the Bay of Fundy and thus to this EIS. Much, if not most, does not appear to have been consulted and or considered in this EIS. A small subset (N=445) of this literature is listed in the Appendix and much of it is relevant to assessing the veracity of claims present in the EIS.

EIS 9.1.7 Pg. 57.
• The standard unit of measure for tides in Canada is metres, not feet. Mixed units reflect mixed thinking and lead to confused or incorrect interpretation.
• Tidal current information and Appendix 40 is not acceptable; especially as the source (model type, data source etc.) is not provided and thus the credibility is questionable.
• There are more sophisticated, higher resolution, and relevant tidal prediction data for the entire region that appear not to have not been consulted or explored, or used. See for example Fig. 4 below.

“The currents shown are those to be expected for the average tidal range at Saint John, New Brunswick of 20.0 feet”
• There is no evidence or argument provided to suggest that: have any bearing or relevance to tidal (or residual that is not addressed) currents in the region of interest. This is unacceptable and can easily lead to misinterpretation.
• The fact that neither wind-driven (event scale) nor residual circulation are addressed is of concern as it is the residual circulation that will be relevant to long-term and mean transport of suspended particulates and/or contaminants associated with the proposed site.
• An example of the potential misinterpretation is provided in the figures below that contrast the tidal elevation (Fig. 1a,b) and tidal currents (Fig. 2 and 3), based on the O1, K1, N2, M2, S2, K2 L2 M4, 2N2, NU2 tidal constituents, between the St. John and the proposed site. The current predictions near the proposed site can be an order of magnitude greater than those near St. John and this example is not apparent in any of EIS-Appendix 40; thus further challenging the veracity and interpretation of Appendix 40.
• An example of the kind of information that should be examined is provided in Fig. 4 that illustrates expected particle trajectories at 25 m depth for a 2-week period in July 2007 based on the M2, K1, N2, S2, O1 and residual tidal constituents.
Fig. 1a. Tidal elevation near proposed site (44° 30’N, 66°10’W)

Fig. 1b. Tidal elevation near St. John NB (45° 14.2’N, 66° 2.5’W)
Fig. 2 Tidal currents near proposed site (44° 30’N, 66° 10’W)

Fig. 3. Tidal currents near St. John NB (45° 14.2’N, 66° 2.5’W)
Fig. 4. Expected particle trajectories at 25 m depth for a 2-week period in July 2007 based on the M2, K1, N2, S2, O1 and residual tidal constituents.
EIS 9.1.7 Mitigation - Pg.62
“Construction affecting the bottom of the intertidal and sublittoral zones will be scheduled during periods of low biological activity.”

- The statement has no credibility as the measure of “biological activity” is not defined (i.e. what precisely is “biological activity”, and what precisely is “low”?); Without clear and precise definition, the “periods” when such activity is expected to be low, and thus to allow construction to go forward, cannot be determined. Scheduling cannot be determined as the determining criteria are ill-defined.

- There is much literature on various biological aspects of various biological processes relevant to the so-called “periods of low biological activity” that appears not to have been consulted and/or considered; for zooplankton alone one can easily find 12 studies not referenced (i.e. consulted in the EIA) listed below and if one examined phytoplankton, fish, and benthic invertebrates one should easily find a 100 more – AND – each of these organisms have many and various seasonal stages of “activity” over the entire year; so “low” becomes a rather curious but important issues in relation to the proposed scheduling claim.


EIS 9.1.7.5 Impact Statements – Pg. 63.
“Since the only direct construction within intertidal and sublittoral marine waters consists of installation of pipe piles in areas of bedrock, turbidity will be minimal and result in a short term, insignificant negative effect, of local scale.”

- It is difficult to accept this claim at face value, especially the “local scale”, given the information provided in Fig.4 above. Further, there is no quantitative measure of “insignificance” provided, and thus the claim is meaningless.

EIS 9.2 Pg 65
“The BioChem data base contains a number of chlorophyll a values for the Digby Neck area as contained in Table NS-4. Since most of the data was collected in early September, it is not possible to determine if there are any seasonal trends in chlorophyll a concentration. However, it is obvious that surface waters contained much higher levels than deeper waters.”

- The literature is replete with papers on repeated and well-defined seasonal patterns in marine (including the Bay of Fundy) phytoplankton biomass and chlorophyll dynamics and this extensive literature does not appear to have been consulted.

EIS 9.2.4 pg 72
“The results of this survey are contained in Table NS – 5. The phytoplankton chlorophyll a values obtained were for composite samples collected within the upper 30 m (100 ft.) of the water column. These results indicate concentrations during the spring are generally within the range for upper waters obtained from the previously mentioned BioChem data base. Concentrations during summer
and fall, however, are much lower and reflect a distinct seasonal trend that suggests a strong spring phytoplankton bloom.”

- These data are at the very best, weak, and they are not interpreted with respect to the extensive literature mentioned above under EIS 9.2 Pg 65.
- There is entirely no quantitative basis to conclude a “distinct season trend” from three (3) data values separated at 3-month intervals.

**EIS 9.2.4 pg. 75**

“Since there was little available information concerning the distribution of marine mammals and the summer distribution of waterbirds in the vicinity of the Whites Point Quarry”

- What is precisely is the definition of “in the vicinity of”?
- There is a rather large and extant literature on whales in the Bay of Fundy that do not appear to have been examined, consulted, considered, or cited in the EIS; thus contradicting the claim of “little available information”. A cursory search of the literature reveals at least 35 likely-relevant papers applying to whales only, of which only one appears to have been consulted (cited) in the EIS.


9.2.11.1.1 North Atlantic Right Whale pg. 118.
• There is no person who knows the population size of the NA right whale. Stating there are about 322 is a misleading use of significant digits. There are estimates in the literature, with error that should be consulted and used.

EIS Volume III; Map 4 pg. 14
• This map is misleading in all several respects and could easily lead to misinterpretation:
  a) The old shipping lanes (labeled “existing”) should not appear on this map as they are no longer relevant; i.e. they no longer exist functionally, and are thus wrong and misleading.
  b) The valid and extant shipping lanes (labeled “new shipping lanes 2003”) are incomplete.
  c) The “traffic separation zone” is not readily discernable and over half of it is no longer relevant (i.e. it is wrong) and is thus misleading
  d) The nominal distribution of the SPUE estimates is not discernable and is thus potentially misleading.

EIS Map 25 pg. 119
• This map is misleading in all respects related to a) through c) above for Map 25, and:
  a) What are the quantitative criteria for defining the “popular whale watching” areas?
  b) The drawn boundaries are suspiciously limited by the “existing” shipping lanes that no longer exist. As such, that would mean that the northern most “popular” are to the east is now inside the “new” and functionally existing shipping lanes – which seems odd. The areas, without a clear, precise and quantitative basis for designation are, at best, hearsay and are thus misleading.

9.2.11.1.2 Fin Whale –pg. 120
• The EIS provides no information on the spatial and temporal distribution of fin whales in the region, although SPUE data exist for the same source used for right whales. Why is this not presented? It appears as an oversight or potential relevance.
• The EIS provides no information on the spatial and temporal distribution of sei whales in the region, although SPUE data exist for the same source used for right whales. Why is this not presented?. It appears as an oversight or potential relevance.
• The EIS provides no information on the spatial and temporal distribution of humpback whales in the region, although SPUE data exist for the same source used for right whales and they are frequently observed in Digby Neck region. Why is this not presented? It appears as an oversight of potential and perhaps critical relevance.

9.2.4 pg. 75 and 9.2.11.1.4 pg. 121
“boat reconnaissances for these taxa were conducted during July and August of 2002 by Bay to Bay Adventures Ltd., an experienced, local whale and seabird tour business operating out of East Ferry, under contract to Bilcon of Nova Scotia Corporation. Weekly trips were made along the coast from Petite Passage to Sandy Cove, approximately 150 m (500 ft.) from shore, and a return trip
approximately 1.9 km (1.2 mi.) from shore. Duration of the trips was approximately two hours depending on the weather and sea conditions. The observation route is shown on Map 21. From May to October 2003, weekly observations of the nearshore waters off Whites Point were made by David W. Kern, B.Sc. Some casual observations of marine mammals using coastal waters adjacent the Whites Point property were made during investigations of the terrestrial fauna in June 2002 and 2004 (see Alliston, 2004A; Alliston, 2004B). Following is a compilation of the species observed.

- Without information on the elevation of the observer(s) on the “boat”, or the transit speed, or the extant weather conditions, it is not possible to assess the veracity of the observations. Limited elevation provides limited visual distance. There is a large literature on the design and application of these kinds of surveys that appear not to have been consulted and thus challenges the veracity of the findings.

- There is a large literature on whales in the Bay of Fundy (see EIS 9.2.4 pg. 75 above) and a large data-base held by the NA Right Whale Consortium that would be highly informative, beyond that of the right whale SPUE data used in the EIS; data that come from the same source. An examination by BILCON of those data would perhaps present a different interpretation of the findings reported on pg 77 and Map 21.

- Although the transit lines employed for the survey may have been designed in relation to blasting concerns, they do not appear to address the ship-strike issue (below) and it is surprising that no effort was made to assess whales of any species in the “vicinity” of the proposed lane to and from the marine terminal which would be an area of some concern.

9.2.13 North Atlantic Right Whale – Ship Interactions – pg. 128

“The right whale is especially susceptible to ship interactions due to its slow movement and extended periods at or near the surface.”

- There is no reference to the source or veracity of these claims.

- Approximately 800 vessels use the shipping lanes annually . . . Other ports such as Bayside, New Brunswick, Eastport, Maine and Hantsport, Nova Scotia account for an additional 200 ships per year.”

- There is no reference to the source or veracity of these statistics, nor on the temporal distribution of vessel traffic, especially during the June-October period most relevant to right whales. Providing these statistics is critical to the estimates provided in the EIS (see XX below)

“Bulk carriers are proposed to transport basalt rock products from the marine terminal at Whites Point. These vessels will depart the inbound shipping lane, follow a designated route to the marine terminal and return to the outbound shipping lane along the same designated route. The location of the proposed route to and from the shipping lanes to the marine terminal is shown on Map 4.”
• What is the rationale for the “designated route? The distributions of several whale species, particularly the humpback whale, are parallel to Digby Neck and the adjoining bathymetry. One consideration of such a route would be orthogonal to the coast and also the traffic lanes. In this manner the probability of encountering a whale would arguably be minimized if the majority of whales are migrating parallel to the coast. Has such a routing to and from the shipping lanes and the proposed marine terminal been considered, and if not why not, and if so why has the proposed routing been recommended over an orthogonal routing.

9.2.13.2 Analyses – pg. 130
“The Whites Point Quarry will generate additional ship traffic in the Bay of Fundy and the eastern seaboard of the U.S. consisting of approximately 50 bulk carriers annually...... This constitutes a 6% increase in this category of vessel traffic in the Bay of Fundy.”
• There is no reference to the source, data or analyses for veracity of this claim.
“Should it be noted that this increase is based only on the estimated number of large vessels (primarily bulk carriers and tankers) and not on total vessels (fishing boats, container ships, cruise ships, ferries etc.).
• The veracity of the “increase” is challenged as above. Further, there is no definition of “large” vessels. Are these vessels being referred to as large actually the “rule” vessels as designated by the Canada Shipping Act, or are they something else? The definition matters as the statistical arguments above rely on such a definition.

9.2.13.2 Analyses – pg. 131
“If based on the latter total vessel traffic, the per cent increase is miniscule.”
• This interpretation relies on the definition of miniscule (not provided) and is thus meaningless, and further compromised by the questionable veracity of the data and statistics (see above) used to drawn such a conclusion.
“In areas of the Bay ESE of this line, the relative probability of encounter decreases markedly (rapidly) toward zero Map 25.”
• This statement could be misinterpreted as the actual probability does not reach zero.
“The proposed ship route from and to the inbound/outbound shipping lanes from the proposed Whites Point marine terminal is through two quadrats of SPUE = 0 whales/1000km and one quadrat of SPUE >0 but<15.559 whales/1000km.
• This statement is subject to the comment provided above (under 9.2.13 North Atlantic Right Whale – Ship Interactions – pg. 130)
• The authors of the EIS should be aware, and make it clear, that the New England Aquarium survey effort expended in this particular area is much lower than in other regions, and thus the uncertainties in these estimates are correspondingly large.
“The low occurrence of right whales in this area is also verified by Bilcon of Nova Scotia Corporation’s Marine Mammal and Seabird Observations in 2002 which recorded no sightings of right whales in this nearshore area.”
• This statement is subject to the comment provided above (see above under 9.2.4 pg. 75 and 9.2.11.1.4 pg. 121)
• Another indicator of low probability for right whales or other species of whales is the lack of whale sightings from whale watching boats frequenting this particular area of the Bay.”
• There is no reference to the source or veracity of this claim.
A factor contributing to whale mortality or severe injury as a result of ship/whale interaction is the size and speed of ships. Although all ships can cause injury, most lethal or severe injuries are caused by ships 80 m (260 ft.) or longer and traveling 26 kph (14 knots) or faster (Laist et al 2001 Ref. 130). In 33 cases of collisions causing lethal or severe injuries, 89% involved vessels moving at 26 kph or
faster. The remaining 11% involved vessels moving at 18.5 to 26 kph (10 to 14 knots). No lethal or severe injuries occurred at speeds below 18.5 kph (Laist et al 2001).

- The above represent a loose and likely misleading interpretation of descriptive histograms and tabulations provided in Laist et al. The reference to “33 cases” is relative to what total number and what about the remainder – irrelevant? This matters as the next “89%” and “11%” rely on it for interpretive value.

- The Laist et al. data, and an updated and expanded version of those data (apparently not consulted) can be used to address this issue quantitatively from a probabilistic perspective. Such analyses can be used to show that the probability of killing a whale or seriously injuring it with a vessel navigating at near 12 knots is 50% (with uncertainties around that value; a speed below which the probabilities decrease (with increasing uncertainty) and above which they increase (with decreasing uncertainty). Thus, vessel speed is an important issue in this context and is not addressed here. The mass of the vessel that is proposed to be used will be much, much greater than that of any whale and thus speed becomes a critical issue in defining the outcome of a collision. “Presently, there are no speed limits on vessels traveling in the Bay of Fundy waters.”

- Such a statement does not prevent the proponent in the EIS to suggest a speed that would help minimize the severity of a collision and no such speed has been suggested to meet that effect and should be.

“As mentioned previously, the location of the marine terminal in close proximity to the designated shipping lanes is considered a primary mitigation measure.”

- A stronger mitigation measure might be a route that is orthogonal to the coast and also the traffic lanes. (see above under 9.2.13 North Atlantic Right Whale – Ship Interactions – pg. 130).

References to Taggart et al. 2003:
The EIS does not make it clear that the above cited document is a “grey”-document report to a funding agency and is not a peer-reviewed publication and is thus subject to error and/or change.
APPENDIX A – a small subset of Bay of Fundy literature relevant to the aquatic sciences

1. Bay of fundy issues: A scientific overview. workshop proceedings, wolfeville, N.S., january 29 to february 1, 1996(1996). (Q1 01381 General; Q5 01523 Conservation, wildlife management and recreation; O 8050 Conferences; Q1 01106 Conferences and other meetings; O 4090 Conservation and Environmental Protection


5. Bay of fundy environmental and tidal power bibliography (second edition)(1985). (Q1 01521 Mechanical and natural changes; Q2 02406 Energy from the sea; Q1 01101 General works

6. Update on the environmental consequences of tidal power development in the upper reaches of the bay of fundy(1984). (Q1 01521 Mechanical and natural changes; Q2 02406 Energy from the sea; Q1 01106 Conferences and other meetings; Q2 02106 Conferences and other meetings


11. Amiro, P. G., & Department of Fisheries and Oceans Canada, Dartmouth, NS (Canada) Diadr. Fish Div. (2003). Population status of inner bay of fundy atlantic salmon (salmo salar), to 1999 (Q1 01442 Population dynamics No. 2488

12. Amos, C. L. A., & Grecian, L. A. (2003). An overview of sedimentological research in the bay of fundy (Q2 02264 Sediments and sedimentation; Q1 01141 General; Q2 02406 Energy from the sea; Q1 01521 Mechanical and natural changes

13. Amos, C. L. (1984). The sedimentation effect of tidal power development in the minas basin, bay of fundy (Q1 01521 Mechanical and natural changes; Q2 02406 Energy from the sea


27. Bogden, G. L. (1985). Oceanographic and botanical observations in intertidal sediments from cobequid bay, bay of fundy, nova scotia (Q1 01442 Population dynamics No. 2488


30. Bogden, G. L. (1985). Oceanographic observations from the bay of fundy for the pre-operational environmental monitoring program for the point lepreau, N.B. nuclear generation station (Q1 01501 General; Q2 02441 General; O 4090 Pollution - Environment; Q1 01521 Mechanical and natural changes


40. Burridge, L. E., Doe, K., Haya, K., Jackman, P. M., Lindsay, G., & Zitko, V. et al. (1999). Chemical analyses and toxicity tests on sediments under salmon net pens in the bay of fundy (Q2 02187 Geochemistry of sediments; Q5 01503 Characteristics, behavior and fate; Q3 01588 Effects of Aquaculture on the Environment; Q1 01588 Effects of Aquaculture on the Environment No. 2291).
45. Cammen, L. M. (1984). Microbial ecology of the bay of fundy (Q1 01201 General; Q2 02406 Energy from the sea; Q1 01521 Mechanical and natural changes; Q2 02406 Energy from the sea; Q1 01201 General).
46. Cammen, L. M. (1984). Possible impacts of tidal power development on microbial populations of the bay of fundy-gulf of maine region (Q1 01521 Mechanical and natural changes; Q2 02406 Energy from the sea; Q1 01201 General).


125. Fisheries Resource Conservation Council, Ottawa, ON [Canada]. (1998). 1999 conservation requirements for scottish shell and bay of fundy groundfish stocks, redfish stocks, units 1-3 and 3-0 and groundfish stocks in division 3Ps (Q1 01604 Stock assessment and management; Q5 01523 Conservation, wildlife management and recreation No. 98.R.6)


140. Gibson, A. J. F., Bryan, J., Amiro, P., & Department of Fisheries and Oceans Canada, Dartmouth, NS (Canada) Diadr. Fish Div. (2003). Release of labeled pacific atlantic salmon into inner bay of fundy rivers from 1990 to 2002 (Q1 01582 Fish culture; Q3 01582 Fish culture No. 1123)


154. Gordon, D. C. J. (1984). Predictions of the impacts of tidal power development on ice conditions in the upper reaches of the bay of fundy (Q1 01521 Mechanical and natural changes; Q2 02406 Energy from the sea


159. Greenberg, D. A. (1984). Predictions of the impacts of tidal power development on ice conditions in the upper reaches of the bay of fundy (Q1 01521 Mechanical and natural changes; Q2 02406 Energy from the sea

160. Greenberg, D. A. (1984). A review of the physical oceanography of the bay of fundy (Q2 02167 Tides, surges and sea level; Q1 01145 Physics and chemistry; Q2 02167 Tides, surges and sea level; Q1 01521 Mechanical and natural changes


162. Greenberg, D. A. The effects of tidal power development on the physical oceanography of the bay of fundy and gulf of maine (Q1 01521 Mechanical and natural changes; Q2 02406 Energy from the sea


164. Hanke, A. R., Page, F. H., Neilson, J., & Department of Fisheries and Oceans, St. Andrews, NB (Canada) Biological Station. (2001). Distribution of cod (Gadus morhua) and haddock (Melanogrammus aeglefinus) eggs and larvae on the Scotian shelf, eastern gulf of maine, bay of fundy and eastern georges bank (Q1 01604 Stock assessment and management No. 2329)

165. Hanke, A. R., page, F. H., Neilson, J., & Department of Fisheries and Oceans, St. Andrews, NB (Canada) Biological Station. (2001). Distribution of pollock (Pollachius virens) eggs and larvae on the scotian shelf, eastern gulf of maine, bay of fundy and eastern georges bank (Q1 01604 Stock assessment and management No. 2345)

166. Hargrave, B. T., Phillips, G. A., & Doucette, L. I., White, M. J., Milligan, T. G., & Wildish, D. J. et al. (1995). Biogeochemical observations to assess benthic impacts of organic enrichment from marine aquaculture in the western isles region of the bay of fundy, 1994 (Q5 01504 Effects on organisms; Q1 01552 Fish culture; Q3 01582 Fish culture; O 4020 Pollution - Organisms/Ecology/Toxicology


170. Harmon, P. R., Glebe, B. D., Peterson, R. H., & Department of Fisheries and Oceans Canada, St. Andrews, NB (Canada) Biological Station. (2004). The effect of photoperiod on growth and maturation of Atlantic salmon (Salmo salar) in the bay of fundy. project of the aquaculture collaborative research and development program (Q1 01582 Fish culture; Q3 01582 Fish culture No. 2458)


172. Hawkins, C. M. (1985). Population carbon budgets and the importance of the amphipod corophium vorticella in the carbon transfer on a cumberland pollock (Pollachius virens) eggs and larvae on the scotian shelf, eastern gulf of maine, bay of fundy and eastern georges bank (Q1 01604 Stock assessment and management No. 2345)

180. Heaps, N. S., & Jones, J. E. (1976). The distribution of the M2 ocean tide in the vicinity of the bay of fundy - from a global numerical model by W. zahel (Q2 02146 TSD distribution, water masses and circulationios, Birkenhead (UK).
188. Hicklin, P. W., & Smith, P. C. (1984). Studies of birds in the bay of fundy: A review (Q1 01361 General; Q2 02406 Energy from the sea; Q1 01521 Mechanical and natural changes
189. Hogans, W. E. (1995). Infection dynamics of sea lice, lepeophtheirus salmonis (copepoda: Caligidae) parasitic on atlantic salmon (salmo salar) cultured in marine waters of the lower bay of fundy (Q1 01528 Fish culture; Q3 01528 Fish culture: O 5000 Aquaculture
196. Hogans, W. E., & Trudeu, D. J. (1989). Preliminary studies on the biology of sea lice, caligus elongatus, caligus curtes and lepeophtheirus salmonis (copepoda: Caligida) parasitic on cage-cultured salmonids in the lower bay of fundy (Q1 01281 General; O 1030 Invertebrates; Q1 01582 Fish
201. Iles, T., & FAO, R. (. (1981). In Shotton R. (Ed.), The origin of sub-allocation of fisheries quota at the international level. the recent history of the management of bay of fundy.
208. Iles, T., & FAO, R. (. (2001). In Shotton R. (Ed.), The origin of sub-allocation of fisheries quota at the international level. the recent history of the management of bay of fundy.


225. Lakshminarayana, J. S. (1984). Possible effects of tidal power development on phytoplankton distribution in bay of fundy (Q1 01521 Mechanical and natural changes; Q2 02406 Energy from the sea; Q1 01481 Productivity


263. Martin, J. D., & Dasmell, M. J. (1983). Records of coho salmon oncorhynchus kisutch (walbaum, 1972), in the bay of fundy and its tributary drainage (Q1 01602 Surveying and prospecting; O 5020 Fisheries and Fishery Biology; Q1 01483 Species interactions: general; Q3 01582 Fish culture No. 2261).


268. Martin, J. L., LeGresley, M. M., Strain, P. M., & Department of Fisheries and Oceans, St. Andrews, NB (Canada) Biological Station. (2001). Phytoplankton monitoring monitoring in the western isles region of the bay of fundy during 1997-98 (Q1 01461 Plankton; Q3 01582 Fish culture; Q1 01481 Productivity; Q1 01582 Fish culture No. 2349).


270. Martin, J. L., & Wildish, D. J. (1990). Algal blooms in the bay of fundy (Q1 01524 Public health, medicines, dangerous organisms; Q1 01582 Fish culture; Q3 01582 Fish culture.


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321. Pohle, G., & Frost, B. Establishment of standard benthic monitoring sites to assess long-term ecological modification and provide predictive sequence of benthic community succession in the inner bay of fundy, new brunswick.


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363. Scott, J. S. (1988). Seasonal spatial distributions of groundfishes of the scottish shelf and bay of fundy, 1974-79 and 1980-84 (Q1 01602 Surveying and prospecting; O 5020 Fisheries and Fishery Biology; Q1 01604 Stock assessment and management
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