# Factors for diamondback terrapin protection with respect to construction projects

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**Basic Northern Diamondback Terrapin (*Malaclemys terrapin terrapin)* biology & phenology to keep in mind**

* Terrapins spend most of their lives in saltmarshes and the waters surrounding the salt marsh.
* Female terrapins come up to nest in sandy, open-canopy uplands adjacent to salt marshes, with a peak of nesting in June, but nesting activity continues through the summer.
* Terrapins hatch from late summer through till October, but some hatchlings remain buried in the nest through till the following spring.
* Hatchlings and juvenile terrapins spend time in uplands and well-drained marshes adjacent to nesting areas, and require access to a source of freshwater. They seek cover under vegetation, wrack, and debris, and will bury themselves in the mud of high and low marsh (Brennessel 2021, p. 121)
* Terrapins brumate (similar to hibernating) by mid-November, once the water temp drops to about 50 degrees F. The reptiles show high site fidelity for their wintering habitats (Castro-Santos et al. 2019).
* Terrapins do not emerge until April/May, even on warm winter days.
* Movement of adult terrapins is highest in May when they emerge from brumation for breeding (2km/day in MA), and again between Aug-Oct (Castro-Santos et al. 2019).
* Terrapins bury themselves in mud to overwinter. Some of the types of environments where they have been found:
	+ Natural depressions on the bottom of creeks where they were covered by a thin layer of mud and 1.6 to 2.6 meters (5-8 ft) of water at low tide (Brennessel 2021, p. 34)
	+ Others buried themselves 0.15-0.5 m deep into the sides of creek banks in areas free of vegetation and underground roots.
	+ Beneath undercut banks in the intertidal zone, groups of multiple individuals were found clustered and buried together and covered by a thin layer of mud.
	+ Those found in more firm areas were partially buried, or simply resting on the surface of the mud (Haramis et al. 2011)

**Implications for scope and sequencing of construction activities to reduce Terrapin impacts**

* General
	+ Prior to commencement of any construction operations, a written wildlife protection workplan for diamondback terrapin protection will need to be developed that addresses the points below. This report will need to be submitted for NYC Parks review and approval.
	+ If terrapins are captured at any time during construction, they are to be placed in large containers in the shade, with an inch of salt marsh water, and then released as soon as possible – preferably within an hour, but no more than four hours later. If captured between November and May, see below.
* To prevent destruction of terrapin nests
	+ Sand piles that are not covered could become a nesting attractant to nesting females at the end of May/beginning of June through late August.
		- Sand that will not be used right away must be covered by a secured tarp and potentially also surrounded with wildlife exclusion fencing (to avoid females nesting in the sand, and then the nests being destroyed when sand is moved)
	+ If placement of fill and sand occurs during nesting season, then planting should happen right away, or the substrate should be covered and/or surrounded by wildlife exclusion fencing until planting (particularly with augurs) is complete.
* To prevent nest predation on site
	+ Do not attract mesopredators (e.g., raccoons and feral cats)
		- These predators are the number one threat to nest success – they dig up nests and eat terrapin eggs. Keep them away by not leaving food out and cleaning up and carrying out food waste. Clean up areas if others are leaving food out for feral cats.
* To prevent overwintering terrapins being disturbed, harmed, or killed
	+ Work in the tidal creeks or adjacent areas should happen before November or after May. In Massachusetts, risk of harm to terrapins was found to be minimized during late fall through early winter (Castro-Santos et al. 2019).
	+ If work must happen between November and May, coordinate with NYC Parks.
		- If terrapins are unearthed or encountered during this time, and earth moving is complete, you can release adult terrapins to rebury themselves. If earth moving will continue, NYC Parks and a local wildlife rehabilitation center should be contacted immediately. No hatchlings, if found, are to be released to the wild during these months. Acceptable wildlife rehabilitators who will accept terrapins include:
			* SI ACC - [(212) 788-4000](https://gcc02.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.google.com%2Fsearch%3Fq%3Dstaten%2Bisland%2Bacc%26sxsrf%3DALiCzsZkBmUOVvXOXQ7DaN7pF2sqZm4lug%253A1652815541106%26source%3Dhp%26ei%3DtfaDYoHkAoyZptQPkuK1yAM%26iflsig%3DAJiK0e8AAAAAYoQExf_BqAyfOYNEy2MKuOJ6qfMdv67Y%26gs_ssp%3DeJzj4tZP1zcsyU03z0gyNmC0UjGosLBMNk4yNTFOMUwxTTU3MrUyqDAzMk9LSjMzMjQ3MEk2NvUSLC5JLEnNU8gszknMS1FITE4GALL4FG8%26oq%3Dst%26gs_lcp%3DCgdnd3Mtd2l6EAMYADIKCC4QxwEQrwEQJzIECCMQJzIECCMQJzIECC4QQzIHCC4Q1AIQQzIECAAQQzIFCC4QkQIyBAgAEEMyBwguENQCEEMyBAguEEM6BwguEOoCECc6BwgjEOoCECc6DQguEMcBEK8BEOoCECc6CgguEMcBEK8BEEM6CwgAEIAEELEDEIMBOg4ILhCABBCxAxDHARDRAzoFCAAQgAQ6CwguEIAEEMcBEKMCOggIABCABBCxA1BtWLQCYJULaAFwAHgAgAG3AYgBwAKSAQMwLjKYAQCgAQGwAQo%26sclient%3Dgws-wiz%23&data=05%7C01%7CGeorgina.Cullman%40parks.nyc.gov%7C1375eec9b51d4e8636d808da3844a3b0%7C32f56fc75f814e22a95b15da66513bef%7C0%7C0%7C637884164696881834%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C3000%7C%7C%7C&sdata=SPze5lrKuI7G%2Bs%2FZmBTmrBLjRblHsLNp6Ksi7jLsa0c%3D&reserved=0) 3139 Veterans Rd W, Staten Island, NY 10309
			* Wild Bird Fund- [(646) 306-2862](https://gcc02.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.google.com%2Fsearch%3Fq%3Dwild%2Bbird%2Bfund%26sxsrf%3DALiCzsYC42RwAydRYyV1WYFm10IBqUB4ZA%253A1652815544113%26ei%3DuPaDYp7IBs-rptQPmKmDoAs%26gs_ssp%3DeJzj4tFP1zc0ys0ut0wrsTBgtFI1qLCwTDYytbAwSTJKNE4yTUmyMqhITDY3TkxMsbCwNDBONUky9eIrz8xJUUjKLEpRSCvNSwEAraAUfQ%26oq%3Dwild%2Bbir%26gs_lcp%3DCgdnd3Mtd2l6EAMYATIOCC4QgAQQsQMQxwEQowIyFAguEIAEELEDEIMBEMcBEK8BENQCMgoIABCABBCHAhAUMgsILhCABBDHARCvATILCC4QxwEQrwEQkQIyCwguEMcBEK8BEJECMggIABDJAxCRAjILCAAQgAQQsQMQgwEyCwguEIAEEMcBEK8BMgUIABCABDoHCCMQsAMQJzoHCAAQRxCwAzoECCMQJzoECAAQQzoFCAAQkQI6BwguENQCEEM6BAguEEM6BwguELEDEEM6CAgAEIAEELEDOg0ILhCABBDHARDRAxAKOgcIABCABBAKOgcIABCxAxAKOgUILhCABDoECAAQCjoNCAAQsQMQgwEQyQMQQzoFCAAQkgM6EAguELEDEIMBEMcBENEDEAo6CggAELEDEIMBEEM6CggAELEDEIMBEAo6BwgAEMkDEEM6CwguEIAEELEDEIMBOhEILhCABBCxAxCDARDHARDRAzoLCAAQsQMQgwEQkQI6CAgAELEDEIMBOhAIABCABBCHAhCxAxDJAxAUOg4ILhCxAxDHARCjAhCRAjoRCC4QgAQQsQMQgwEQxwEQrwE6BwgAELEDEEM6EAguEIAEEIcCEMcBEK8BEBQ6CAgAEIAEEMkDOgsILhCABBCxAxDUAjoICC4QgAQQsQM6CAguEIAEENQCSgQIQRgASgQIRhgAUM4JWKRZYPxkaBVwAXgBgAHNAogB1haSAQgwLjE5LjAuMZgBAKABAcgBCcABAQ%26sclient%3Dgws-wiz%23&data=05%7C01%7CGeorgina.Cullman%40parks.nyc.gov%7C1375eec9b51d4e8636d808da3844a3b0%7C32f56fc75f814e22a95b15da66513bef%7C0%7C0%7C637884164696881834%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C3000%7C%7C%7C&sdata=n%2B1yAIipT0%2FGx%2B6qqC37Xz4RfG2wJECsnqPploW1Bls%3D&reserved=0).
			* Laurie Kramer- 347-668-7401
	+ To make sure there are no terrapins in brumation underneath the surface, a survey should be conducted to gently probe the target substrate prior to work to identify or rule out overwintering terrapins in the tidal creeks. Alternatively, if resources exist, a survey using radio transmitters can be done (see Castro-Santos et al. 2019 for an example).

**References** (contact NYC Parks if access to these references is needed)

Brennessel, B. (2021). Diamonds in the Marsh: A Natural History of the Diamondback Terrapin.

Castro-Santos, T., Bolus, M. & Danylchuk, A.J. (2019). Assessing Risks from Habor Dredging to the Northernmost Population of Diamondback Terrapins Using Acoustic Telemetry. *Estuaries and Coasts*. 42: 378-389.

Haramis, G.M., Henry, P.P.F., and Day, D. D. (2011). Using Scrape Fishing to Document Terrapins in Hibernacula in Chesapeake Bay. *Herpetological Review* 42(2), 170-177.

Yearicks, E. F., Wood, R. C. and Johnson, W. S. (1981). [Hibernation of the northern diamondback terrapin, *Malaclemys terrapin terrapin*](https://link.springer.com/content/pdf/10.2307/1351546.pdf). Estuaries 4: 78-80.

## **SECTION XX-X - BIOLOGIST – CUSTOM**

**XX 4.1** **INTENT:**

The Contractor will engage the services of a **BIOLOGIST – CUSTOM** who will serve as an advisor to the Engineer, in consultation with the NYC Department of Parks and Recreation Natural Resources Group (NYC Parks), and to direct the Contractor to avoid endangering diamondback terrapin (*Malaclemys terrapin*) during construction.

**XX 4.2** **DESCRIPTION:**

Work occurs in marshland or in Jamaica Bay, a large estuarine environment with New York City’s largest concentration of diamondback terrapin turtles. The following is an overview of diamondback terrapin life history.

* Terrapins nest in sandy, open-canopy uplands adjacent to salt marshes, with a peak of nesting in June, but nesting activity continues through the summer.
	+ Terrapin eggs hatch from late summer through October, but some hatchlings remain buried in the nest through the following spring.
	+ Hatchlings and juvenile terrapins spend time in uplands and well-drained marshes adjacent to nesting areas, and require access to a source of freshwater. They seek cover under vegetation, wrack, and debris, and will bury themselves in the mud of high and low marsh.
	+ Terrapins brumate (similar to hibernation) by mid-November, once the water temp drops to about 50 degrees F.
	+ Terrapins do not emerge until April/May, even on warm winter days.

Diamondback terrapins bury themselves in mud to overwinter. Some of the types of environments where they have been found include natural depressions on the bottom of creeks where they were covered by a thin layer of mud and 1.6 to 2.6 meters (5-8 ft) of water at low tide. Others buried themselves 0.15-0.5 m deep into the sides of creek banks in areas free of vegetation and underground roots.  They may also overwinter beneath undercut banks in the intertidal zone.

The Contractor shall engage the services of a Biologist, approved by the Engineer, to survey all project areas, assess habitat viability, perform seasonally appropriate due diligence, and implement or recommend conservation best practices to prevent direct or indirect impacts to diamondback terrapin.

The Contractor must furnish to the Engineer and NYC Parks Natural Resources Group the Biologist’s professional credentials for evaluation. Minimum required qualifications for the Biologist:

1. must have a Master of Science in one of the natural sciences or a Bachelor of Science or Arts in the same field with field experience in herpetology, environmental science or wildlife biology/ecology, or have equivalent professional experience.
2. must have a minimum of five (5) years of previous experience in work of this nature and in completing the necessary submittals required under this Contract.
3. be a person or firm regularly engaged in the business of wildlife habitat evaluation, with demonstrable capability in the work herein described.
4. will identify staff necessary to perform the specified work, including the Biologist themself and/ or project manager.

At construction Notice-To Proceed, the Contractor is required to submit the names and resumes of at least three (3) prospective candidates to the Engineer for review and approval.

**XX 4.3** **METHODS:**

The Biologist’s presence onsite is required when directed by the Engineer. The Biologist’s role shall include, but not be limited to, the following work:

1. Providing equipment, material and qualified personnel.
2. Perform habitat assessments and surveys across all project areas in observance of diamondback terrapin life history and implement or recommend interventions to prevent direct or indirect impacts to diamondback terrapins.
3. Report: The Biologist shall prepare and submit a Report to the Engineer following the completion of their assessment.

Prior to commencement of any construction operations, the Biologist will develop a written wildlife protection workplan for diamondback terrapin preservation and submit a report for NYC Parks review and approval detailing:

* methods for identifying diamondback terrapin habitat
* locations of potential diamondback terrapin habitat throughout the entire project area
* potential conflicts between the construction and terrapin behavior according to seasonal life history
* recommendations for avoiding impacts
* measures for managing sand stockpiles, which may be attractive habitat for terrapin nesting
* measures for stabilizing, or isolating, newly graded or placed sand which may be attractive habitat for terrapin nesting
* measures for eliminating undue attraction of the site to animals which may predate on terrapin nests (for example, racoons and feral cats)
* methods for surveying or spotting terrapins and methods for surveying or spotting terrapins while working in tidal creeks between November and May when terrapins may be in brumation underneath the surface.
* measures for handling terrapins if encountered during construction. During the warmer months (May 1 – October 31), captured turtles are to be placed in containers with an inch of salt marsh water, and then released as soon as possible – preferably within an hour, but no more than four hours later. During the cooler months (November 1 – April 30), hatchlings should not be released to the wild. If encountered during this period NYC Parks and a local wildlife rehabilitation authority should be contacted immediately. Here is an initial list of wildlife rehabilitators that can care for diamondback terrapins:
	+ SI ACC - [(212) 788-4000](https://gcc02.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.google.com%2Fsearch%3Fq%3Dstaten%2Bisland%2Bacc%26sxsrf%3DALiCzsZkBmUOVvXOXQ7DaN7pF2sqZm4lug%253A1652815541106%26source%3Dhp%26ei%3DtfaDYoHkAoyZptQPkuK1yAM%26iflsig%3DAJiK0e8AAAAAYoQExf_BqAyfOYNEy2MKuOJ6qfMdv67Y%26gs_ssp%3DeJzj4tZP1zcsyU03z0gyNmC0UjGosLBMNk4yNTFOMUwxTTU3MrUyqDAzMk9LSjMzMjQ3MEk2NvUSLC5JLEnNU8gszknMS1FITE4GALL4FG8%26oq%3Dst%26gs_lcp%3DCgdnd3Mtd2l6EAMYADIKCC4QxwEQrwEQJzIECCMQJzIECCMQJzIECC4QQzIHCC4Q1AIQQzIECAAQQzIFCC4QkQIyBAgAEEMyBwguENQCEEMyBAguEEM6BwguEOoCECc6BwgjEOoCECc6DQguEMcBEK8BEOoCECc6CgguEMcBEK8BEEM6CwgAEIAEELEDEIMBOg4ILhCABBCxAxDHARDRAzoFCAAQgAQ6CwguEIAEEMcBEKMCOggIABCABBCxA1BtWLQCYJULaAFwAHgAgAG3AYgBwAKSAQMwLjKYAQCgAQGwAQo%26sclient%3Dgws-wiz%23&data=05%7C01%7CGeorgina.Cullman%40parks.nyc.gov%7C1375eec9b51d4e8636d808da3844a3b0%7C32f56fc75f814e22a95b15da66513bef%7C0%7C0%7C637884164696881834%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C3000%7C%7C%7C&sdata=SPze5lrKuI7G%2Bs%2FZmBTmrBLjRblHsLNp6Ksi7jLsa0c%3D&reserved=0) 3139 Veterans Rd W, Staten Island, NY 10309
	+ Wild Bird Fund- [(646) 306-2862](https://gcc02.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.google.com%2Fsearch%3Fq%3Dwild%2Bbird%2Bfund%26sxsrf%3DALiCzsYC42RwAydRYyV1WYFm10IBqUB4ZA%253A1652815544113%26ei%3DuPaDYp7IBs-rptQPmKmDoAs%26gs_ssp%3DeJzj4tFP1zc0ys0ut0wrsTBgtFI1qLCwTDYytbAwSTJKNE4yTUmyMqhITDY3TkxMsbCwNDBONUky9eIrz8xJUUjKLEpRSCvNSwEAraAUfQ%26oq%3Dwild%2Bbir%26gs_lcp%3DCgdnd3Mtd2l6EAMYATIOCC4QgAQQsQMQxwEQowIyFAguEIAEELEDEIMBEMcBEK8BENQCMgoIABCABBCHAhAUMgsILhCABBDHARCvATILCC4QxwEQrwEQkQIyCwguEMcBEK8BEJECMggIABDJAxCRAjILCAAQgAQQsQMQgwEyCwguEIAEEMcBEK8BMgUIABCABDoHCCMQsAMQJzoHCAAQRxCwAzoECCMQJzoECAAQQzoFCAAQkQI6BwguENQCEEM6BAguEEM6BwguELEDEEM6CAgAEIAEELEDOg0ILhCABBDHARDRAxAKOgcIABCABBAKOgcIABCxAxAKOgUILhCABDoECAAQCjoNCAAQsQMQgwEQyQMQQzoFCAAQkgM6EAguELEDEIMBEMcBENEDEAo6CggAELEDEIMBEEM6CggAELEDEIMBEAo6BwgAEMkDEEM6CwguEIAEELEDEIMBOhEILhCABBCxAxCDARDHARDRAzoLCAAQsQMQgwEQkQI6CAgAELEDEIMBOhAIABCABBCHAhCxAxDJAxAUOg4ILhCxAxDHARCjAhCRAjoRCC4QgAQQsQMQgwEQxwEQrwE6BwgAELEDEEM6EAguEIAEEIcCEMcBEK8BEBQ6CAgAEIAEEMkDOgsILhCABBCxAxDUAjoICC4QgAQQsQM6CAguEIAEENQCSgQIQRgASgQIRhgAUM4JWKRZYPxkaBVwAXgBgAHNAogB1haSAQgwLjE5LjAuMZgBAKABAcgBCcABAQ%26sclient%3Dgws-wiz%23&data=05%7C01%7CGeorgina.Cullman%40parks.nyc.gov%7C1375eec9b51d4e8636d808da3844a3b0%7C32f56fc75f814e22a95b15da66513bef%7C0%7C0%7C637884164696881834%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C3000%7C%7C%7C&sdata=n%2B1yAIipT0%2FGx%2B6qqC37Xz4RfG2wJECsnqPploW1Bls%3D&reserved=0).
	+ Laurie Kramer- 347-668-7401
* identification of a suitable relocation habitat for adult terrapins.
* protocol for reporting impacts to terrapins.

**XX 4.4** **SUBMITTALS:**

The Contractor will submit the following to the Engineer for review and approval:

1. Qualifications of Biologist.
2. Detailed method of operations for review by Engineer (in consultation with Parks) prior to start of work.
3. Annual Reports
4. Final Report

**XX 4.5** **MEASUREMENT:**

The quantity to be measured for payment under this section BIOLOGIST –CUSTOM will be the time, measured in PERSON HOURS, that the Biologist actually performed the work as specified and to the satisfaction of the Engineer.

**XX 4.6** **PAYMENTS:**

The contract price bid for BIOLOGIST –CUSTOM will be a unit price PER PERSON HOUR and shall cover the cost of all labor, material, reports, plant, equipment, inspection, insurance, and incidentals required to complete the work, all in accordance with the Contract Drawings, the specifications and the directions of the Engineer.

*Payment will be made under:*

Item No. Item Pay Unit

XX 4 BIOLOGIST –CUSTOM PERSON-HOUR (P/H)