VRAK – MUSEUM OF WRECKS
ARKEOLOGISK RAPPORT 2019:20

NORD STREAM 2
ARCHAEOLOGICAL MONITORING OF FIVE SHIPWRECKS

BALTIC SEA
SWEDISH EEZ

VRAK
MUSEUM OF WRECKS

MIKAEL FREDHOLM

en del av STATENS **MARITIMA** OCH **TRANSPORTHISTORISKA** MUSEER

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SVENSK SAMMANFATTNING

Analyser av filmer från de fem fartygslämningarna visar att de är opåverkade av gasledningskonstruktionen, Nord Stream 2 (NSP2). De mindre förändringar som kunde ses på fartygslämning S-R30-0997 kan bero på trålning eller fiske.

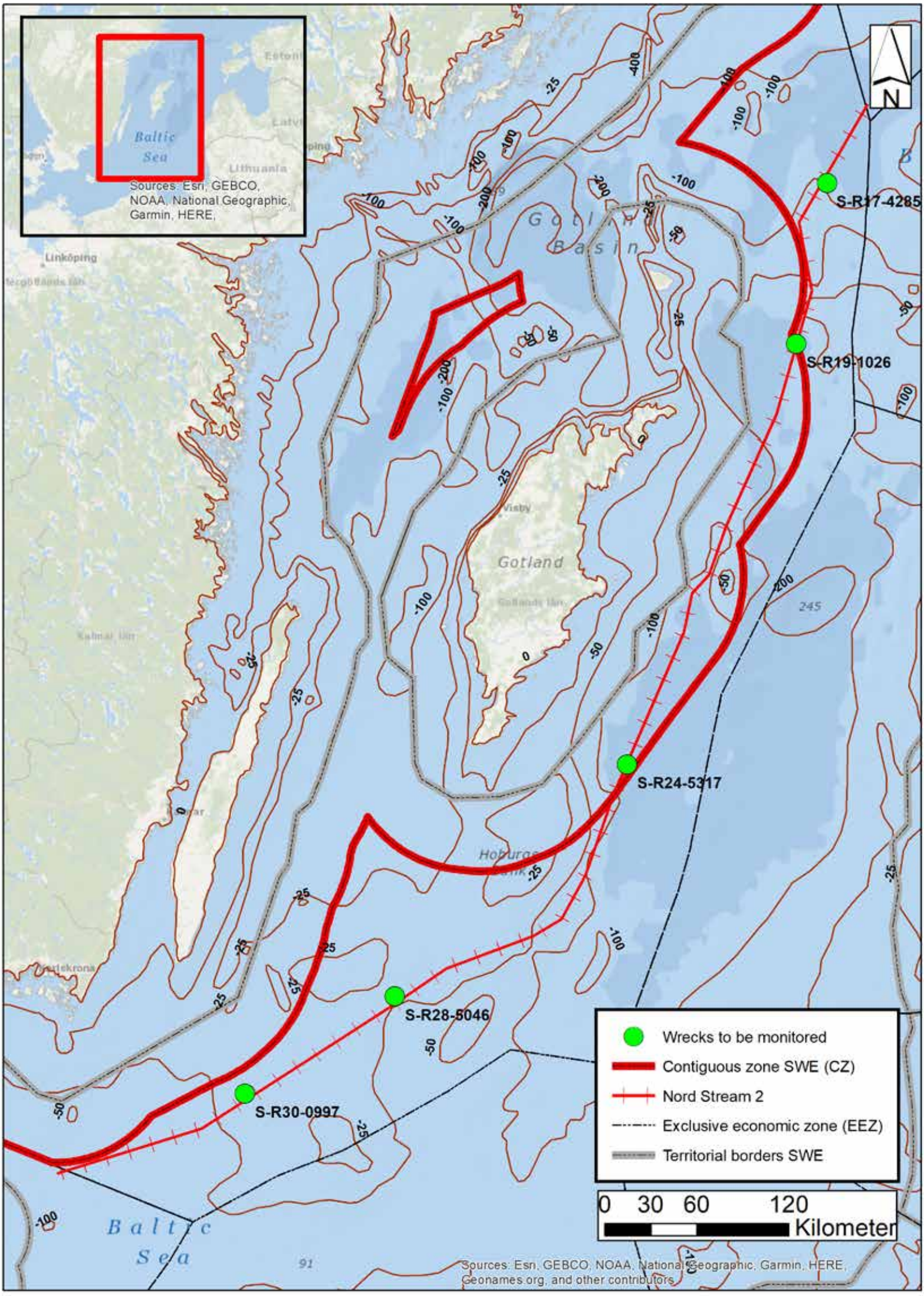
Tre av de tidigare fem analyserade fartygslämningarna (S-R17-4285, S-R28-5046 och S-R30-0997) bedömer Statens maritima och transporthistoriska museer (SMTM) ha förlist före 1850, vilket gör att de räknas som fornlämningar enligt kulturmiljölagen (1988:950) (Fredholm 2019:6).

SUMMARY

Analysis of film from the five shipwrecks shows that they are undisturbed by the construction of the gas pipeline Nord Stream 2 (NSP2). The minor changes that where visible on shipwreck S-R30-0997 possibly depends on trawling or fishing.

Three of the five analysed shipwrecks (S-R17-4285, S-R28-5046 and S-R30-0997) are estimated by SMTM to have foundered before 1850, and therefore these shipwrecks are to be considered ancient monuments, according to the definitions in the Swedish Heritage Conservation Act (1988:950) (Fredholm 2019:6).

FIGURE 1. The NSP2 pipeline in the Swedish economic zone, Contiguous zone and the five shipwrecks that has been monitored before (Fredholm 2019) and now after the pipeline construction. © ESRI, processed by Mikael Fredholm, SMTM.


Baltic Sea
Estonia
Latvia
Lithuania
Sources: Esri, GEBCO, NOAA, National Geographic, Garmin, HERE,
N
S-R17-4285
S-R19-1026
S-R24-5317
S-R28-5046
S-R30-0997
Gotland Basin
Gotland
Visby
Linköping
Kalmar län
Hoburgs bank
Wrecks to be monitored
Contiguous zone SWE (CZ)
Nord Stream 2
Exclusive economic zone (EEZ)
Territorial borders SWE
0 30 60 120
Kilometer
Sources: Esri, GEBCO, NOAA, National Geographic, Garmin, HERE, Geonames.org, and other contributors

BACKGROUND

Construction of the new gas pipeline Nord Stream 2 (NSP2) has taken place in 2019 in the Swedish exclusive economic zone (EEZ) and in the Swedish contiguous zone (fig. 1). NSP2 will run in parallel with the existing gas pipeline Nord Stream.

The Swedish National Maritime and Transport Museums (SMTM) has during 2019 performed an archaeological analysis of ROV-films from seven objects along the planned NSP2-route. The analysis resulted in five shipwrecks, of which three are considered to be ancient monuments, according to the definitions in the Swedish Heritage Conservation Act (1988:950) (Fredholm 2019).

The five shipwrecks that were monitored in the archaeological analysis before the construction (Fredholm 2019) have now been monitored after the construction of the pipeline. This analysis has been done in order to see if the construction work has had any effect on the shipwrecks state of preservation.

SMTM is hereby presenting an archaeological report for the analysis of ROV-film of five shipwrecks near the planned NSP2-route. This analysis of ROV-films and multibeam-images compares the state of the wrecks before and after the pipeline construction.

PURPOSE, METHOD AND EVALUATION

This is the second out of two reports during 2019. In the first report (Fredholm 2019) the main purpose of the analysis was to determine if the five wrecks in the pipeline corridor could be considered to be ancient monuments according to the definitions in the Swedish Heritage Conservation Act (1988:950). The second purpose of that analysis was to document the condition of the wrecks before construction, so that their status could be analysed after the construction of the pipeline, in this second report (Fredholm 2019).

In this current report the main purpose of the analysis and cultural heritage monitoring is to compare the condition of the five shipwrecks before the construction with the condition of those wrecks after the construction of the pipeline. The pre-lay ROV-filming and multibeam-imaging of the wrecks has been done by MMT and the post-lay inspections has been performed by Allseas. Their reports includes high resolution bathymetry/multibeam-images as well as still pictures of the wrecks, with “events” (photo stations). These “events” will be used for comparison of the wrecks status in this second SMTM report. The pre-lay photos in this report has the MMT/Nord Stream 2-logos and the post-lay has no logos.

ANCIENT ENVIRONMENT AND HISTORY

The around 510 km long stretch of NSP2 in the Swedish EEZ and CZ has a varied bottom topography, bottom types and depth of about 30 meters in the waters at the southern EEZ to over 200 meters in the northern part of the EEZ (Fig. 1). The known ancient monuments registered in the National Heritage Boards database (Fornsök) close to NSP2 were found mainly in the Nord Stream (NSP) project and the now ongoing NSP2 project. Except for these wrecks the Swedish Maritime Administration has found and registered other shipwrecks in the Swedish EEZ.

PREVIOUS INVESTIGATIONS

SMTM has written several archaeological reports about the wrecks along the two gas pipelines, from the first report in 2010 for NSP and the last in 2019 for NSP2 (Fredholm 2010, Fredholm 2013, Fredholm 2016, Fredholm 2017 and Fredholm 2019).

TABLE 1: The five shipwrecks that are to be analysed in this report (from Fredholm 2019). Ancient monuments; ship wrecks that have foundered before 1850 according to the definitions in the Swedish Heritage Conservation Act. * Although SMTM argues that it has sunk after 1850, a younger wreck can be classified as an ancient monument by the County Administrative board.

ID No.	Ancient monument	Description
S-R17-4285	Yes	Shipwreck
S-R19-1026	No	Shipwreck
S-R24-5317	No*	Shipwreck
S-R28-5046	Yes	Shipwreck, known since NSP1; as S-29-93462
S-R30-0997	Yes	Shipwreck

RESULTS

The five analysed shipwrecks are considered by SMTM to be undisturbed by the construction of the pipeline. The minor changes on shipwreck S-R30-0997 possibly depends on trawling, fishing, waves and currents.

TABLE 2: The five wrecks that have been analysed.* Although SMTM argues that it has sunk after 1850, a younger wreck can be classified as an ancient monument by the County Administrative board.

ID No.	Ancient monument	Description	Status
S-R17-4285	Yes	Shipwreck	Undisturbed
S-R19-1026	No	Shipwreck	Undisturbed
S-R24-5317	No*	Shipwreck	Undisturbed
S-R28-5046	Yes	Shipwreck	Undisturbed
S-R30-0997	Yes	Shipwreck	Possibly disturbed by trawling/fishing

S-R17-4285

The shipwreck is undisturbed by the construction of the pipeline.

A comparison of the multibeam-images from the prelay-inspection and the postlay-inspection shows no signs of changes on the wreck and the surrounding seabed. The ROV-inspection confirms that the ten objects (A-J) "events" and the wreck are unchanged.

In the first SMTM analysis the shipwreck was believed to be from the 17th or an 18th century, based on an assessment of the ships construction, anchor, ships boat, capstan, details etc. (Fredholm 2019:10).

After SMTM: s analysis (Fredholm 2019) a team of archaeologists from MMT, Deep Sea Productions, Södertörn University (MARIS) and the University of Southampton carried out another survey, which also included a 3D-photogrammetry. The team believes after studying the ships construction and especially the two possible swivel guns (fig. 2) that the ship might be from the 15-16th century. They plan to return to the wreck and take up a wooden plank, for dating of the wreck (New York Times 2019 and MMT 2019).

According to Johan Rönnby, professor at Södertörn University (MARIS), MMT: s plan is to take dendrochronological samples in January 2020 (Rönnby 2019).

The anchor form is the same as seen in the Baltic for much of the 17th century and the capstan seems more typical for late 16th century than earlier. The horizontal beakhead and steep bowsprit are some early features, and with the clinker construction, it might lead to an early dating. But these features persisted well into the 16th century. Clinker construction continued to be in use, even on ships larger than this in the 17th century. The swivel gun (Event A) could be as early as 1500, but stave-built wrought iron swivels was used in the early 17th century. Shipbuilding traditions survives a long time after its most popular times, but a dating to 1600 seems more likely than 1500. But the ship probably dates to somewhere between 1500 and 1650 (Hocker 2019).

What also might speak against a dating to the 15-16th century are for example the ships shape,

where is widest in the furthermost third of the ships length. Several 15-16th century ships where widest in the middle (Mary Rose and "Osmundvraket", a new find by SMTM in Stockholm). The wreck has for example similar shapes as 17th century *Bodekull* and *Resande Man*. The capstan seems to be similar to the one at *Bodekull*. If the possible cannon isn't a cannon, it might be a beam for the sails (Alí 2019).

If the wreck is an almost fully preserved wreck from the 15-16th century it´s remarkable. Hopefully dendrochronological samples could shed light on the dating and provenience of the ships timber.

FIGURE 2. Photos on the possible swivel gun on the starboard side. Pre-construction (Event A). Photo: MMT/ Nord Stream 2.

FIGURE 3. Photos on the possible swivel gun/beam (left) and a pulley (right) on the starboard side. Post-construction (Event A). Photo: Allseas.

S-R19-1026

The shipwreck is undisturbed by the construction of the pipeline.

A comparison of the multibeam-images from the prelay-inspection and the postlay-inspection shows no signs of changes on the wreck and the surrounding seabed. The ROV-inspection confirms that the nine objects (A-I) "events" and the wreck are unchanged. Event E, F and G has according to the Allsea report no images post-lay.

This is probably a wreck of a fishing boat from the second half of the 20th century (Fredholm 2019:16).

S-R24-5317

The shipwreck is undisturbed by the construction of the pipeline.

A comparison of the multibeam-images from the prelay-inspection and the postlay-inspection shows no signs of changes on the wreck and the surrounding seabed. The ROV-inspection confirms that the 17 objects (A-Q) "events" and the wreck are unchanged. Event E, F and G has according to the Allsea report no images post-lay. But SMTM could see in the postlay-film that the teacup in event F is unchanged. And even if the exact photo angles was not found in the post-lay ROV-film, SMTM judge that even the E, F and G areas are unchanged.

The earlier analysis by SMTM dates the wreck to the late 19th century or early 20th century. The ship was probably a steel bark ship with a steam engine (Fredholm 2019:19).

S-R28-5046/S-29-93462

The shipwreck is undisturbed by the construction of the pipeline.

A comparison of the multibeam-images from the prelay-inspection and the postlay-inspection shows no signs of changes on the wreck and the surrounding seabed. The ROV-inspection confirms that the ten objects (A-J) "events" and the wreck are unchanged.

As seen from earlier inspections, the sedimentation seems to vary on this site (Fredholm 2019:26). For example event A; a ship timber and stones seems to have different sedimentation on the postlay-inspection. The sediments on the sea bottom and the wreck seems to be volatile and light. Therefore the sedimentation seems to change from time to time. The wreck as a whole does look unchanged between 2009 and the postlay-inspection 2019.

This wreck was already investigated for the Nord Stream and then also known as S-29-93462. It´s a clinker built ship with a cargo (ballast) of lime stones and barrels with iron, possible so called Osmund iron that became a common export commodity from Sweden in medieval times. The ship's cargo and construction indicated that it could be a medieval ship (Fredholm 2010:27).

FIGURE 4. Event A. Photos of ship timber and stones. Pre-construction (left) and post lay (right). Some of the stones seems to be more covered by sediments post-lay than pre-lay. Photo: Allseas and MMT/Nord Stream 2.

S-R30-0997

The shipwreck is considered to be undisturbed by the construction of the pipeline, but minor changes are visible. The minor changes possibly depends on trawling or fishing and less likely on the pipeline construction.

A comparison of the multibeam-images from the prelay-inspection and the postlay-inspection shows no signs of changes on the wreck and the surrounding seabed. The ROV-inspection confirms that three (A-, B and H) of the objects eight objects (A-H) "events" on the wreck have moved slightly.

Event A: a brick has moved around 20 cm.

Event B, possible lid pot, a wooden object has moved according to Allseas. SMTM has hard to see any movement, maybe it´s only a few cm.

Event H, a block and planks has moved and it´s possible that the plank has moved the block slightly.

As Allseas mention in their report a plastic bucket close to the rudder (E) was found. By the rudder is what seems to be modern textile/plastic glove visible on the prelay-inspection.

The earlier analysis of this highly degraded wooden wreck indicated a dating to the 18th century. Because it lies on just 38 meters depth it´s probably affected both by waves, currents and fishing/trawling, as parts of fishing nets where visible on the wreck (Fredholm 2019:29).

FIGURE 5. Event A, where a brick has moved around 20 cm. Pre-construction (left) and post lay (right). Photo: Allseas and MMT/Nord Stream 2.

FIGURE 6. Event B, possible lid pot, where a wooden object might have moved a few cm. Pre-construction (left) and post lay (right). Photo: Allseas and MMT/Nord Stream 2.

FIGURE 7. Event H; a block, where a plank has moved. Pre-construction (left) and post lay (right). Photo: Allseas and MMT/Nord Stream 2.

CONCLUSION

The five analysed shipwrecks are considered by SMTM to be undisturbed by the construction of the pipeline. The minor changes on shipwreck S-R30-0997 possibly depends on trawling or fishing and less likely on the pipeline construction.

Three of the five analysed shipwrecks (S-R17-4285, S-R28-5046 and S-R30-0997) are estimated by SMTM to have foundered before 1850, and therefore these shipwrecks are to be considered ancient monuments, according to the definitions in the Swedish Heritage Conservation Act (1988:950) (Fredholm 2019).

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ANCIENT HERITAGE OBJECT INSPECTION REPORT SWEDEN
S-R17-4285

ANCIENT HERITAGE OBJECT INSPECTION REPORT SWEDEN
S-R19-1026

ANCIENT HERITAGE OBJECT INSPECTION REPORT SWEDEN
S-R24-5317

ANCIENT HERITAGE OBJECT INSPECTION REPORT SWEDEN
S-R27-0640

ANCIENT HERITAGE OBJECT INSPECTION REPORT SWEDEN
S-R27-5051

ANCIENT HERITAGE OBJECT INSPECTION REPORT SWEDEN
R-29-93462

ANCIENT HERITAGE OBJECT INSPECTION REPORT SWEDEN
S-R30-0997

Allseas Wreck reports 2019, after construction of the gas pipeline:

Post-Lay Cultural Heritage Object Inspection Report Sweden Wreck S-R17-4285

Post-Lay Cultural Heritage Object Inspection Report Sweden Wreck S-R19-1026

Post-Lay Cultural Heritage Object Inspection Report Sweden Wreck S-R24-5317

Post-Lay Cultural Heritage Object Inspection Report Wreck R-29-93462
(NSP2 ID: S-R28-5046)

Post-Lay Cultural Heritage Object Inspection Report Wreck S-R30-0997

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Kulturmiljölagen (Swedish Heritage Conservation Act 1988:950), https://www.raa.se/lagar-och-stod/kulturmiljolagen-kml/

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Maps

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TECHNICAL AND ADMINISTRATIVE DATA

Swedish National Maritime and Transport Museums (SMTM) dnr: 5.3.1–2018-1599
SMTM Project no: 2081158
SMTM Project leader: Mikael Fredholm
Area of investigation: Baltic Sea, Swedish EEZ and CZ.
Cause of survey: Construction of gas pipeline
Client: Nord Stream 2
Nord Stream 2 ref: W-PE-MSC-PSE-REP-965-CULEVAEN-01
Coordinate system: UTM 33N and 34N

Documentation: The report is kept on SMTM:s webpage and other documents at the SMTM:s archives in Stockholm. Storage of digital documentation materials: video, still photographs and digital drawings are stored digitally on SMTM:s servers. All storage is redundant and backup copies stored on physically separate location from the main storage. The hardware for the storage is replaced by 3 to 4 year intervals to maintain the fault tolerance and the storage capacity. In the digital management of the documentation material and report preparation has been used the following software: ESRI ArcMap 10.3, Microsoft Word 2007, Photo Shop CS3, Deep View 4 others.

GIS / measurement data: are archived at the SMTM:s servers.

Participants SMTM
Mikael Fredholm, Fred Hocker, Håkan Altrock, Patrik Höglund, Marco Alí and Jim Hansson.

APPENDIX

Analysed Objects

ID No.	Distance to pipeline (m)	Fornsök (RAÄ-no	Ancient monument	Description
S-R17-4285	203	61:3	Yes	Shipwreck
S-R19-1026	238	2:160	No	Shipwreck
S-R24-5317	93	2:164	No*	Shipwreck
S-R28-5046	142	2:48	Yes	Shipwreck
S-R30-0997	730	2:165	Yes	Shipwreck

The five wrecks that have been analysed. Ancient monuments; shipwrecks that have foundered before 1850 according to the definitions in the Swedish Heritage Conservation Act. * Although SMTM argues that it has sunk after 1850, a younger wreck can be classified as an ancient monument by the County Administrative board.

NORD STREAM 2

The Swedish National Maritime and Transport Museums (SMTM) has analysed ROV-film from five shipwrecks along the planned gas pipeline Nord Stream 2 (NSP2). The wrecks are considered by SMTM to be undisturbed by the construction of NSP2. Minor changes are visible on one wreck, but the changes probably depends on trawling or fishing and less likely on the pipeline construction.

Three of the five analysed shipwrecks are estimated by SMTM to have foundered before 1850. The oldest shipwreck is possibly medieval, one wreck is likely from the 16-17th century and one is probably from the 18th century. Therefore these shipwrecks are to be considered ancient monuments, according to the definitions in the Swedish Heritage Conservation Act.

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