CURRICULUM VITAE

Position title:	Specialist on scour and erosion and project manager
Name of firm:	Hoffmans Advice (self-employed)
Name of expert:	Gijs HOFFMANS
Date of birth:	6 August 1958
Nationality:	Dutch

Key qualifications:
Mr. Hoffmans has more than 30 years of professional experience in the field of scour, internal erosion, river engineering, dike and dam engineering, and flood protection projects and has acted several times as expert as well as project manager. He began his career as a research engineer on scour and erosion and the corresponding geotechnical processes. In addition, he has examined the erodibility of both bed protections around hydraulic structures in non-uniform flow conditions and revetments at dikes (or embankments), such as grass covers. With this up-to-date knowledge, he has advised several clients all over the world on designing and assessing hydraulic structures.

His design experience has been gathered in various countries (Japan, Argentina, Germany, United Kingdom, Brazil, China, United States of America, France, and the Netherlands) and covers river training works and their aspects of geotechnical engineering and stability. More specifically, this experience has also focussed on hydraulic structures such as estimating the dimensions of scour holes in relation to the magnitude of bed protection and the risks of shear failures and/or flow slides, considering several types of scour (general scour, bend scour, confluence scour, live-bed scour, and clear-water scour). The combination of research and onsite project-related advice has increased his insight into the mathematical modelling of internal erosion phenomena, especially retrogressing (backward) erosion or piping.

At present, he is involved in similar projects as principal adviser to the Dutch water management agency Rijkswaterstaat He is also involved in designing and assessing the flood-protection river dikes along the Rhine and Meuse rivers with the national water boards and regional water agencies. Currently, he advises the Hollandse Delta water board and Rijkswaterstaat on monitoring and assessing the many scour holes occurring in the national tidal rivers close to the city of Rotterdam. Throughout his career, he has acted to bridge the gap between state-of-the-art research outcomes and daily civil and hydraulic engineering practice all over the world.

Education:
- M.Sc. Civil Engineering (1986), Delft University of Technology, The Netherlands. Main subjects: river and hydraulic engineering. Special subjects: irrigation, hydropower, flood control, and dams and dikes.
- Ph.D. (doctoral thesis) Civil Engineering (1992), Delft University of Technology, The Netherlands. Main subjects: fluid mechanics and river and hydraulic engineering. Special subjects: scour and erosion processes at hydraulic structures due to current and waves, overall degradation, local scour, constriction scour, bend scour, confluence scour, time-dependent scour, live-bed scour, clear-water scour, and bed protections.

Other training:
- Delft3D course: Flexible Mesh; River Modelling. Deltares, 2018.
- Geotechnical course: Advanced Course in Geotechnics and Soil Mechanics. GeoDelft, 2010.
- Postgraduate course: Project Management Course. RijksOpleidingsinstituut, 2007.
- Postgraduate course: Project Management. Bureau Zuidema, 1998.
- Postgraduate course: Sloping Sea Walls, Dikes and Revetments. Postacademisch Onderwijs, 1997.
- Postgraduate course: River Engineering Course; Reservoir Management, and Environmental Impact Assessment. Post-academisch Onderwijs, 1996.

Membership to professional associations and journals of publications:
- 1996–present: Member of the International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE).
- 1996–present: Member of the International Association of Hydraulic Research (IAHR).
- 1998–2006: Secretary of the National Technical Advice Committee for Water Defence Technology/Innovation Platform (TAW-T).
- 2006: Chair of International Conference on Scour and Erosion (ICSE-3), Amsterdam, The Netherlands.
- 2000–present: Core member of International Technical Committee on Scour and Erosion (TC-213).
- 2000–present: Member of Scientific Committee of International Conference on Scour and Erosion.
- 2000–present: Reviewer of *Journal of Hydraulic Engineering*, *Journal of Hydraulic Research*, and *Arabian Journal for Science and Engineering*.

- 2000–2006: Secretary of the Dutch Society for Soil Mechanics and Geotechnical Engineering.
- 2004. Consultant to Office of the Assistant Secretary of the Army (U.S. Army Corps of Engineers); received an award from the corps for contribution to mathematical modelling of scour and erosion, presented for excellence in serving the nation and the army.

Keynote speaker:
- 2002: Invited lecture, 'On the Challenges of Scour Prediction' at the ICSE-1 (College Station, USA).
- 2012: Invited lecture, 'Developments in Scour and Erosion' at the ICSE-6 (Paris, France).
- 2014: Invited lecture, 'An Overview of Piping Models' at the ICSE-7 (Perth, Australia).

Author:
- *Scour Manual*, Balkema, Rotterdam (1997).
- *Influence of Turbulence on Soil Erosion*, Eburon, Delft (2012).
- *Scour Manual, Current-Related Erosion*, update to the *Scour Manual* of 1997, Taylor and Francis (to be published in 2020).
- *Shields–Darcy Model. An Alternative Piping Model*? (to be published).

Currently the author of more than 50 publications on scour prediction; stability of bed protection and granular filters; turbulence near hydraulic structures; stability of dikes, piping, and heave; and strength of grass cover on earthen dikes. More information on conference papers and journal manuscripts can be found at https://scholar.google.nl/citations?user=KGITXv0AAAAJ&hl=nl.

Employment record relevant to the assignment:

Period	Employing organisation, title/position, contact information for references	Country	Summary of activities relevant to the assignment
1986–1992	**Employer:** Delft University of Technology, Delft, The Netherlands **Title/position:** Research engineer **Contact information for reference**: Laboratory of Fluid Mechanics, Delft, The Netherlands Prof. Dr. Ir. Wim Uijttewaal Tel. +31 (0)15 27 81953	Netherlands	• Guided and mentored master's students, conducted scour experiments in the laboratory, studied the processes of scour and erosion, and wrote scientific and conference papers and Ph.D. research/doctoral thesis. • Taught civil engineering students on hydraulic structure design. • Co-organised and attended national and international conferences on hydraulic engineering research advances.
1992–2008	**Employer:** Rijkswaterstaat, Dutch Ministry of Water Management, posted in the city of Delft, The Netherlands **Title/position:** Research engineer and project manager **Contact information for reference**: Ir. Hans Janssen, Rijkswaterstaat, Dutch Ministry of Water Management, posted in the city Utrecht, The Netherlands M: +31 (0) 6 51034832 Prof. Drs. Ir. Han Vrijling, Horvat & Partners, Delft, The Netherlands Tel: +31 (0)85 750 5050	Netherlands	• Conducted research as a research engineer on both the influence of turbulence on the local scour process downstream of sills and the flow characteristics of granular filters (1993–1997). These innovative studies were successfully conducted in cooperation with Kingston University (England), Bundesanstalt für Wasserbau Karlsruhe (Germany), and Deltares (The Netherlands). • Managed the project of the Bergambacht experiment, a prototype test in which the real strength of an earthen dike was examined (1999–2002). • Guided as project manager of two technical reports, viz. 'Piping and Heave in Earthen Dikes/Dams' (1998–1999) and 'Failure Mechanism of Dikes/Dams' (1999–2001). • Initiated as technical manager (2002–2007) the European project ComCoast on coastal research (Interreg IIIB North Sea Programme). • Managed as project manager (2004–2007) the national research programme Strength and Loading on Water Defence Infrastructures (SBW). • Managed as river engineer and river morphologist the Dutch River guidelines programme Room for the Rivers (2003–2007).
2008–2019		Netherlands	• Until 2012, managed various projects for the nationwide

	Employer: Deltares **Title/position:** Senior hydraulic specialist and project manager **Contact information for reference**: Deltares, Delft, the Netherlands Tel: +31 (0)88-335 8273		research programme SBW on water infrastructures. • Guided as project manager of WTI-VTV (until 2012), in charge of the project to establish new updated engineering guidelines, norms, and standards for assessing primary water defences in the Netherlands. • Contributed to the ICOLD bulletin as hydraulic expert in charge of research on internal erosion (piping, contact erosion, suffusion, and leakage). • Author of two books: *Influence of Turbulence on Soil Erosion* (2012) and *Scour Manual, Current-Related Erosion* (2020).
2020–present	**Employer:** Hoffmans Advice, self-employment **Title/position:** Director and consultant **Contact information for reference:** Prof. Dr. Ir. Bas Jonkman, Delft University of Technology, Delft, The Netherlands Tel: +31 (0) 15 27 85278	Netherlands	• Advised Rijkswaterstaat, Eiffage, Nord Stream 2 on predicting the scour and erosion processes in the tidal rivers near Rotterdam, Bordeaux, Baltic Sea for the engineering assessment of the overall stability of bridges, tunnels, dikes, river training works and pipe lines. • Advised national water boards and regional water agencies for the assessment and design of primary flood defences, focussing especially on the risks of mechanism piping. • Supervised M.Sc. and Ph.D. research students at the Delft University of Technology, Delft, the Netherlands.

Language skills (indicate only languages in which you can work):

Languages	Speaking	Reading	Writing
English	Excellent	Excellent	Excellent
German	Fair	Fair	Poor
French	Fair	Fair	Poor
Dutch	Mother tongue		

Adequacy for the assignment:

Name of assignment or project: Scour, 'Simone Veil' bridge
Year: 2020–present **Location:** France
Client: Eiffage
Main project feature: Bordeaux is a port city in the Gironde department in the Southwestern France and counts many bridges that connect the left and right banks of the Garonne River. The new bridge 'Simone Veil' due for completion in 2023 will link the municipalities of Bègles and Floirac. The 44-metre-wide and 545 m long structure will accommodate traffic and pedestrians, as well as it is aimed to be used for hosting events. Eiffage is a French civil engineering construction company and has asked Hoffmans Advice to calculate the scour process as function of time for both the temporarily works (cofferdams) and the foundations of the new bridge.
Position held: Expert on scour
Activities performed: In charge of the scour calculations. Discussed design topics of the bed protection and risk assessment of the new bridge during skype meetings. The conclusions and recommendations are reported in a technical note.

Name of assignment or project: Piping, STOWA (Foundation for Applied Water Research)
Year: 2020–present **Location:** The Netherlands
Client: STOWA
Main project feature: STOWA is the knowledge centre of the regional water managers in the Netherlands. Its mission is to develop, collect, distribute and implement applied knowledge, which the water managers need in order to adequately carry out the tasks that their work supports. This expertise can cover applied technical, scientific, administrative-legal or social science fields. STOWA invited Hoffmans Advice to guide students at universities and to assist water authorities, especially with the piping failure mechanism.
Position held: Expert on piping
Activities performed: Supervising several M.Sc. and Ph.D. research students in modelling the mechanism internal erosion, especially piping, at the Delft University of Technology, University Utrecht, University of Twente.

Name of assignment or project: Piping, Lekdijk
Year: 2020–present **Location:** The Netherlands
Client: Dorst Waterbouw Consult
Main project feature: Mourik reinforces and improves the Dutch dikes to ensure the hinterland/polder from flooding, for example the primary riverine dikes along the Lek. Usually these dikes are designed in a traditional way with buttresses. However, Mourik also uses alternative solutions both practically and theoretically. Therefore, Mourik requested Dorst Waterbouw Consult and Hoffmans Advice to reviewing the assessment of some dike sections on the piping failure mechanism.
Position held: Expert on piping
Activities performed: In charge of calculating the seepage length with the piping models Shields-Darcy and Sellmeijer II. Reported and discussed the computational results to Dorst Waterbouw Consult and Mourik.

Name of assignment or project: Scour, gas pipelines in Baltic Sea
Year: 2020–present **Location:** The Netherlands
Client: Advanced Consultancy Romke Bijker (ACRB)
Main project feature: Engineering consultant Ramboll of Nord Stream 2 has made an assessment of the seabed scour in the Baltic Sea that is potentially caused by the thrusters of dynamic positioning lay barges operating in shallow water with sandy seabed. Since the assessment shows significant scour, Nord Stream 2 requested ACRB a peer review of this scour study.
Position held: Expert on scour
Activities performed: In charge of reviewing technical reports. Questions were submitted to ACRB, which subsequently were discussed during a skype call with Nord Stream 2 and Ramboll. The results of the discussions in the form of the conclusions and recommendations were reported to ACRB and submitted to Nord Stream 2 in a Technical Note.

Name of assignment or project: Reinforcement of dikes, piping
Year: 2019–present **Location:** The Netherlands
Client: Dutch Ministry of Infrastructure and Water Management, Rijkswaterstaat Agency
Main project feature: The Flood Protection Programme (in Dutch: Hoogwaterbeschermingsprogramma [HWBP]) is an alliance between national water boards and Rijkswaterstaat. The objective of HWBP is for all main flood defences in the Netherlands to be reinforced in a sober and efficient manner by 2050, so that they meet the legal standards laid down in the renewed National Water Law and thus guarantee water-related safety in the Netherlands. This means that the total costs of a main flood defence system during its entire remaining lifespan are minimised (life cycle approach). The alternative piping model (Shields–Darcy model), which is physically correct, must be further validated with the current guiding principle (Sellmeijer II), especially for practical situations. The expectation is that this research will lead to better substantiated water-related safety with a substantial cost reduction for the HWBP program in the order of several hundreds of millions of euros.
Position held: Expert on internal erosion and piping
Activities performed: Currently, as a piping specialist, launching a computational framework to assess and quantify the risks of piping according to the Shields–Darcy piping model, in conjunction with experts from both Rijkswaterstaat and the national water boards.

Name of assignment or project: *Scour Manual*
Year: 2017–2019 **Location:** The Netherlands
Client: Dutch Ministry of Infrastructure and Water Management, Rijkswaterstaat
Main project feature: Hydraulic structures are vulnerable to scour around their foundations. Scour can compromise the stability of a structure, leading to a significant risk of damage or even failure. The first edition of the *Scour Manual* was written in the 1990s after the completion of the Dutch Delta Works. The new manual has been an indispensable reference for river engineers and asset managers since its publication. It presents analytical formulas such as the Breusers equilibrium method and new scour equations based on Newton's second law. Therefore, it can be applied directly in engineering practice for all types of hydraulic structures.
Position held: Author and expert on scour and erosion, project manager
Activities performed: Coordinated and managed a team of experts and scientists in updating theory and practice on scour, collected data on all scour formulas in use in the world, provided engineers with a comprehensive table of contents, reviewed and edited all submitted write-ups, and delivered the latest research outcomes in this field. As member of the editorial committee, contributed substantial sections of the state-of-the-art manual, discussed progress with the ministerial team at the client, Rijkswaterstaat, and coordinated and disseminated the case studies with the relevant consultancy firms and contractors for further use in daily engineering practice (project costs: EUR650,000).

Name of assignment or project: Spijkenisse bridge
Year: 2017–2019 **Location:** The Netherlands
Client: Dutch Ministry of Infrastructure and Water Management, Rijkswaterstaat
Main project feature: The traffic road bridge near Spijkenisse (Rotterdam) was built in the early 1970s over the lower reaches of the Oude Maas tidal river. This waterway is one of the most important shipping routes from the North Sea, Hoek van Holland, toward inland cities of Dordrecht and Moerdijk. Due to the many passing ships, the intense inland navigation and shipping, and the strong semi-diurnal tidal currents in the waterway, scour holes have developed at an alarming rate and extent, both downstream and upstream of the bridge piers and abutments. Mitigation measures were devised.

Position held: Expert on scour and erosion, project manager
Activities performed: On behalf of Rijkswaterstaat, in charge of a field assessment and a second opinion on the riverbed and its impacts on the stability of the bridge pier according to the current guidelines. In charge of establishing mitigatory measures for repair and improvement works. Although several alternatives were developed, a classical solution was opted for: filling the very deep scour holes with sand quarried from the New Waterway channel using dredging equipment. To prevent erosion near the bridge piers the riverbed and the embankments (toes and underwater side slopes) were protected by applying large fascine mattresses covered with rock materials.

Name of assignment or project: Railway bridge Nijmegen
Year: 2015 **Location:** The Netherlands
Client: City of Nijmegen
Main project feature: The Spiegel Waal is a man-made bypass canal in the Dutch river Waal near Nijmegen. This canal was constructed between 2013 and 2015 as part of the Room for the River Waal project, part of the national flood prevention programme Room for the River. The railway bridge connects Nijmegen with the Lent district. As this bridge has three streamlined piers and is relatively wide, special attention was paid to both the scour process downstream of the bed protection and the geotechnical stability of the piers.
Position held: Expert on scour and erosion, river morphologist
Activities performed: As a specialist, provided rapid field assessment to the Municipality of Nijmegen with respect to the scouring and the dimensions of the bed protection both downstream of the piers and along the right and left adjacent embankments. Moreover, determined the risk of failure in relation to the frequency of extreme flood water levels, based on the outcome of the statistical analysis of approximately 150 years of time series and water level records.

Name of assignment or project: Wave overtopping research programme (Strength and Hydrodynamic Loading on Water Defences: Dike Technology [SBW])
Year: 2008–2014 **Location:** The Netherlands
Client: Dutch Ministry of Infrastructure and Water Management, Rijkswaterstaat
Main project feature: Study on wave overtopping and grass cover strength on earthen dikes, as part of the nationwide research programme SBW, to develop the safety assessment tools for the main water defences of the Netherlands. In 2007, a project group was formed to study and answer the research questions concerning the application of grass cover resistance in case of wave overtopping. Prototype tests were performed with a wave overtopping simulator on several Dutch, Belgian, and Vietnamese dikes during the winter seasons. A closed grass sod cover proved to be very adequate against the erosive forces of high wave overtopping volumes.
Position held: Hydraulic specialist, project manager
Activities performed: As a specialist and project manager (project costs: EUR3,750,000), contributed to establishing a set of engineering design tools and 'a computational framework' to successfully calculate the erodibility of grass cover revetments. Author of many chapters and sections of the assessment manual *Grass Cover Revetments on Earthen Dams/Dikes*. This research led to authoring and co-authoring various national and international conference papers and journal publications.

Name of assignment or project: Internal erosion
Year: 2009–2013 **Location:** France
Client: Électricité de France (EDF)
Main project feature: Internal erosion is one of the major causes of embankment dam failure. When constructing new dams, protection against internal erosion is provided by zoning constructional core materials and providing filters. However, many existing dams are not adequately zoned or equipped with filters and might therefore be vulnerable to internal erosion. This research contribution also led to a re-examination of the assessment of the piping of the riverine dikes along the French river Rhône. The research results were based on the piping models by Sellmeijer and Shields–Darcy and are considered crucial to the design practice of not only the Rijkswaterstaat agency and the national water boards but also water authorities all over the world.
Position held: Principal scour and erosion specialist
Activities performed: As a specialist, reviewed an existing earthen dam (owned by EDF). Special attention was paid to the mechanisms of internal erosion. Conducted site tests and laboratory experiments, with special attention to retrogressive erosion or piping, resulting in a joint contribution to the International Commission on Large Dams (ICOLD) Bulletin 164 on internal erosion of dams, dikes and levees and their foundations.

Name of assignment or project: National Safety Guidelines for Dike Technology
Year: 2008–2012 **Location:** The Netherlands
Client: Dutch Ministry of Infrastructure and Water Management, Rijkswaterstaat
Main project feature: Rijkswaterstaat and Delft Hydraulics developed an innovative assessment method for main flood defences (Dutch: Wettelijk Toets Instrumentarium) for the water boards and Rijkswaterstaat (client). The new method was developed to check whether the riverine, estuarine, and coastal flood defences comply with the statutory safety standards. This new method focussed on various structural dike components. The project consisted of various sub-projects in which the development of each specific failure mechanism of dikes and/or earthen embankments could be analysed and discussed.
Position held: Project manager

Activities performed:. As project manager, in charge of monitoring the overall project progress as well as the quality of the research results, in close cooperation with the external team of experts of the Expertise Network Water Safety organisation (project costs: EUR1,250,000).

Name of assignment or project: Special dams
Year: 2010–2011 **Location:** Brazil
Client: Optipar Participacoes LTDA
Main project feature: Research was conducted on special dams for generating hydropower. The objective of the study was to check both the feasibility of and the constraints on applying the proposed conceptual design and construction of the dams. It was assumed that during closure, alluvial material from the riverbed is eroded by the river flow itself. The rock bed should be checked for suitability as the foundation for a dam. Trucks used to transport rock material seem to be an economic construction method. If a flood discharge is expected to pass the dam during the construction phase, then a better method is a combined horizontal and vertical closure. In addition to the construction method, the mechanisms of piping, permeability of the dam, scour downstream of the dam, and stability of the rock were examined.
Position held: River engineer and river morphologist
Activities performed: As an expert, in charge of investigating the closure of the special dams. This proposed closure method is similar to the Dutch method used in the 1960s, 1970s, and 1980s during the implementation of the mega project Delta Works in the southwestern part of the Netherlands. Moreover, as river morphologist, studied the mechanisms of internal erosion and local scour downstream of the special dams.

Name of assignment or project: National Guidelines on river engineering
Year: 2003–2007 **Location:** The Netherlands
Client: Rijkswaterstaat, Ministry of Infrastructure and Water Management
Main project feature: This guideline provides recommendations for the design, construction, maintenance, and management of river dikes and river-widening measures. The most important topics at the heart of the new guidelines are safety standards, dike reinforcement, and room for the river. Safety measures must often improve the spatial quality of the development of the bordering riverine-integrated land area, and widening of the riverbed (lowering water level) has become a full-fledged alternative to dike reinforcement. This national manual consists of four parts. Part 1 contains the general information that is important when designing river engineering works in the river area. The information includes a description of the river area and the river processes involved; legislation; safety policy; and an interpretation of the concept of spatial quality, robust engineering design, and the process from the problem statement to the project implementation of civil engineering works. Part 2, called 'Exploration and Design Process', elaborates on the activities and processes that occur in the phases of problem exploration, conceptual design, and detailed engineering design, for both river's anatomical aspects and spatial quality. Moreover, it contains information on the preparation of the assessment framework. Part 3 handles the actual design of a river dike, whereas Part 4 focusses on how to design and implement a river-widening project.
Position held: River engineer and river morphologist
Activities performed: As the chief specialist and member of the project team, in charge of reviewing and safeguarding the overall quality of the manual. Drafts were disseminated and subsequently discussed among the team of national experts and stakeholders and then finalised successfully, in a plenary session presentation to the high officials of the ministry and Rijkswaterstaat (client).

Name of assignment or project: Technical report on stability factors (including update of 'Water-Retaining Earthen Structures')
Year: 2003–2007 **Location:** The Netherlands
Client: Dutch Ministry of Infrastructure and Water Management, Rijkswaterstaat
Main project feature: This technical report provides a design method for determining geotechnical stability factors (angle of internal friction and cohesion). These parameters are valid for all Dutch flood defences. In the update of the 'Water-Retaining Earthen Structures' technical report, attention was paid to the schematisation of substrate and water pore pressures and the consequences of the roots of trees and buildings on dikes, drainage systems, filter structures, watertight screens in dikes, and modes of execution of dike civil works. The uncertainties inherent in soil surveys, such as the complexity of the layering, forgotten sand gullies, and classification of soil layers, are included by introducing a schematisation factor.
Position held: Project manager and river morphologist
Activities performed: As project manager (project costs: EUR750,000), in charge of overall coordination, management, reporting, and quality control of all deliverables to be submitted to the stakeholders and then submitted to the ministry.

Name of assignment or project: ComCoast (COMbined functions in COASTal defence zones)
Year: 2002–2007 **Location:** The Netherlands
Client: Dutch Ministry of Infrastructure and Water Management, Rijkswaterstaat
Main project feature: In the early 2000s, no engineering tools were available to assess grass revetments on sea dikes. These sea defences protect not only the Netherlands but also parts of Belgium, to be tested along the various types of coasts encountered in these countries. Therefore, ComCoast was initiated by the European Union (project costs: EUR5,775,538) The project aims to develop and demonstrate innovative solutions to flood protection in coastal areas across Europe. It creates and applies new methodologies to evaluate multifunctional flood defence zones from an economic and social point of view. A more gradual transition from sea to land creates benefits for a wider coastal community and environment. The

aim of ComCoast is to explore the spatial potential for coastal defence strategies at current and future sites in the North Sea Interreg IIIb region, while considering the impacts of climate change.
Position held: Initiator and technical manager
Activities performed: As manager, in charge of managing the daily coordination and cooperation between the participating member countries to synchronise the actions on the ground and establish common modus operandi for solutions conferences. Focus was placed on better understanding the failure mechanisms of coastal flood protection works, especially the natural grass cover system found on many coastal earthen dikes. Theoretical and practical tools were compiled, tested, and then shared with all experts and colleagues of the member countries. Publications were written in international journals and disseminated during various international conferences in England, Germany, and Denmark. Therefore, the governmental agency Rijkswaterstaat attempted to initiate a European project to improve the existing assessment models.

Name of assignment or project: MOU Netherlands – China
Year: 2002–2007 **Location:** The Netherlands
Client: Ministry of Water Resources of China (Dike Technology)
Main project feature: Based on the Memorandum of Understanding Between China and the Netherlands, scientific and engineering information was exchanged with respect to all mechanisms relevant to the hazards, risks, and safety of the hinterland (polders) during high river and seawater-level events. These mechanisms include flood control, scour and erosion, rip-rap (bed protection), and stone stability.
Position held: Project manager
Activities performed: Organised and coordinated international conferences and seminars on flood defence in Beijing. Co-organised workshops and keynote lectures. These aimed to achieve all project modalities required to facilitate the exchange of data and information from research in the Netherlands and China on flood mitigation works and the stability of river works against scour and erosion phenomena. Special attention was paid to local scour phenomena around and downstream of hydraulic structures, contact erosion, and outlet erosion (or piping) underneath hydraulic structures.

Name of assignment or project: MoA Netherlands – United States of America
Year: 2002–2004 **Location:** The Netherlands
Client: U.S. Corps of Engineers
Main project feature: In the United States, bridge scour is one of the three main causes of bridge failure (the others being accidental waterway collision and overloading). It has been estimated that approximately 60% of all bridge failures result from scour and other hydraulic-related causes. It is the most common cause of highway bridge failure in the United States, where several major bridge failures resulted from scour near piers in the 1990s. As a result of these bridge collapses, an American delegation of scour specialists visited Europe (United Kingdom, the Netherlands, Germany, and Switzerland) to gather European knowledge and experience in design and mitigation. Based on the Memorandum of Agreement between the U.S. Corps of Engineers and Rijkswaterstaat, scientific and engineering information was exchanged with respect to the different types of scour and the relevant geotechnical processes, such as shear failures and flow slides.
Position held: Scour expert and geotechnical engineer
Activities performed: As chair, organised the International Conference on Scour and Erosion held in Amsterdam (2004). Coordinated seminars on scour in Delft and The Hague. Co-organised workshops and keynote lectures to achieve all project modalities required to facilitate the exchange of data and information from research in the Netherlands and the United States of America. As a special assistant to the Assistant Secretary of the Army (U.S. Army Corps of Engineers), received an award from the corps for contribution to modelling scour and erosion (presented for excellence – serving the nation and the army).

Name of assignment or project: Bergambacht experiment (research dike technology)
Year: 1999–2001 **Location:** The Netherlands
Client: Dutch Ministry of Infrastructure and Water Management, Rijkswaterstaat
Main project feature: During the high-water period of 1995, hardly any of the dikes in the Netherlands seriously deformed. Therefore, the government decided to devise a system to conduct such test modalities, aiming for better flood protection works such as dike stability. Desk studies, laboratory tests, and an earthen dike prototype experiment known as the Bergambacht test were initiated to determine the actual strength of dikes. The importance of a better insight into the actual strength of dikes is threefold: 1) During high water, the decision to evacuate could be delayed, and fewer evacuations might occur in the future; 2) insufficient knowledge of the actual strength of dikes might lead to unnecessary and expensive reinforcements of a dike; 3) due to climate change, a reduction of the difference between the model strength and the actual strength could be established and further used for these safety assessment procedures.
Position held: Project manager, river morphologist
Activities performed: To simulate the strength of a typical dike along Dutch rivers, the test dike near Bergambacht was used for benchmark testing. As a project manager, organised all activities needed for testing the dike, such as preparing the test, coordinating the predictions of the failure of the dike, and communicating with the press. The project costs, including research and study were EUR2,150,000.

Name of assignment or project: Granular filters research programme
Year: 1999–2004 **Location:** The Netherlands, Germany, and United Kingdom
Client: Dutch Ministry of Infrastructure and Water Management, Rijkswaterstaat, in cooperation with the Bundes Anstalt für Wasserbau in Karlsruhe (Germany) and Kingston University London (United Kingdom)

Main project feature: Granular filter elements are robust and provide a solid contact interface between the filter and base layers of earthen structures such as dams, dikes, and retaining walls. Granular filters can smoothen bed irregularities, providing a more uniform construction base. Moreover, they are easy to repair. The major disadvantage of granular filters is it is difficult to achieve uniform construction underwater to ensure the required design thickness of each successive filter layer. Different loading parameters in horizontal granular filter layers have been established. The turbulence in an open channel flow acts on the protective bed and penetrates through the pores. Laboratory tests and theoretical mathematical modelling were established and jointly conducted in close cooperation with the Bundesanstalt für Wasserbau, Germany, and Kingston University London, UK.
Position held: Initiator of FERC (Filter Erosion Research Club) and project manager
Activities performed: As a hydraulic engineering specialist, examined the flow characteristics in the open pores of granular filters. Based on laser Doppler measurements, derived velocity profiles to determine the thickness of both the top layer and filter layer (geometrically open filter). This bed protection differs from the traditional one as defined by Terzaghi and Peck (geometrically closed filters). Although both filters are internally stable, geometrically open filters are significantly thinner and therefore cheaper and are hence valuable for practical use. Several international publications have been written on this topic. The total research costs were EUR1,500,000.

Name of assignment or project: 'Water-Retaining Earthen Structures' technical report
Year: 1999–2004 **Location:** The Netherlands
Client: Dutch Ministry of Infrastructure and Water Management, Rijkswaterstaat
Main project feature: This technical report is a tool for designing and managing water-retaining earthen structures, especially with regard to aspects of geotechnical stability. It covers all the geotechnical parameters that play a role in the static and dynamic stability of these structures. All state-of-the-art scientific and engineering references and design methods have been compiled and processed in a comparative analysis, including computations and standardisation rules. The structures under review related to water-retaining functions of structures located in urban areas, along roads, highways, on bridges, and in agricultural exploitations, and the project aimed to unify nationwide practices among consultants, professionals, and practising engineers.
Position held: Project manager
Activities performed: As project manager, coordinated and managed the team of researchers, scientists, and engineers from various institutions and consulting firms to write, edit, and publish this technical report (project costs: EUR650,000).

Name of assignment or project: 'Sand Boils' technical report
Year: 1997–1999 **Location:** The Netherlands
Client: Dutch Ministry of Infrastructure and Water Management, Rijkswaterstaat
Main project feature: Piping is a phenomenon which can threaten the stability of flood defences. This phenomenon can arise when particles of soil in an earthen dam or embankment, under the action of extreme large-scale hydraulic head, are likely to become eroded and are entrained and transported downstream underneath the flood defence structures (piping). Within the scope of designing new flood defences or reinforcing or monitoring existing ones, safeguards against the occurrence of these phenomena (piping hazards) must be verified. Various calculation rules are available to verify such safeguards, varying from simple empirical rules for the first (reinforcement) design of a flood defence or the safety monitoring of an existing flood defence, to advanced calculation models for more precise design and testing.
Position held: Project manager and river morphologist
Activities performed: As chief editor of the technical report and chair of the research project group, wrote, edited, and published the technical report on sand boils successfully, on time, and within the given budget (project costs: EUR475,000).

Name of assignment or project: 'Revetments in Paraná River'
Year: 2000–2001 **Location:** Argentina
Client: Hydraulic Laboratory of the Argentina Institute for Water
Main project feature: The Paraná river is the second longest river in South America and of great importance to the draining of large parts of the river basin in Argentina. The lower reaches of the river form a delta which flows out into the Rio de la Plate. Between Rosario and Victoria, a bridge connection was built over this river with a width varying from 600 m to 2,000 m. The abutments and embankments were protected with a system of block mats placed on geotextile against the impacts of current and waves. The embankments consisted of sand, covered with a clay cover and vegetation.
Position held: Senior hydraulic engineer and river morphologist
Activities performed: In charge of designing the dimensions of both the bed protection and the scour holes close to the foundation of the bridge piers in the Paraná river (study costs: EUR75,000). The design included the criteria and boundary conditions to ensure the geotechnical stability of the piers and abutments (occurrence of shear failures and flow slides) under all possible river hydrological scenarios. The design advice was widely reported (Revetments in Paraná River).

Name of assignment or project: Design of scouring and bed protection
Year: 1996–1998 **Location:** Japan
Client: Akashi National College of Technology (Scour & Erosion)
Main project feature: In order to establish a design of bed protection works, in-situ scour experiments were conducted, where the bed roughness was varied. The time-dependent scour including the equilibrium scour depth was investigated using both Japanese and Dutch scour equations and models.

Position held: Chief designer of river training works
Activities performed: As chief designer, exchanged scientific and engineering information regarding scour and erosion processes downstream of bed protections, writing memoirs for Akashi National College of Technology No.41 (1998). The study and research costs were EUR175,000.

Expert's contact information:
E-mail: hoffmans.advice@outlook.com
Mobile phone in the Netherlands: +31 6 22402183

Certification:
I, the undersigned, certify that to the best of my knowledge and belief, this CV correctly describes myself, my qualifications, and my experience, and I am available, as and when necessary, to undertake the assignment in case of an award. I understand that any misstatement or misrepresentation described herein may lead to my disqualification or dismissal by the client.

GIJS HOFFMANS		30 May 2020
Name of expert	Signature	Day/month/year