The Perfect Performance based Contract - how should it be?

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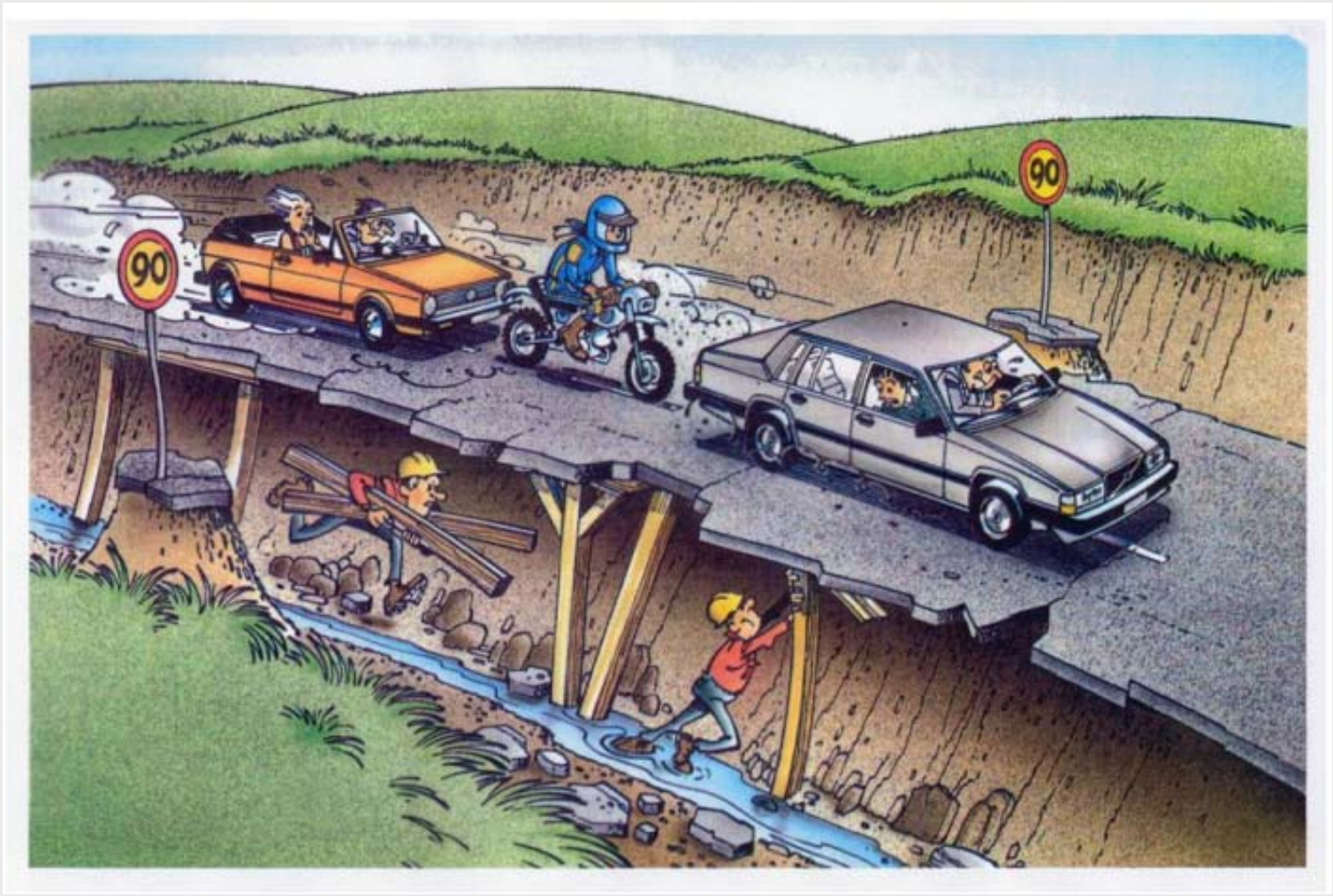
Sustainable road maintenance?



Performance based contracts - NPRA strategy

- Use of performance based contracts will be increased up to 2012
  - AADT > 5000: 50 % by 2012
  - AADT < 5000: 10 % by 2012
  - The number of contracts will be increased with 10% pr year
- Current experience shows that these type of contracts give increased service life

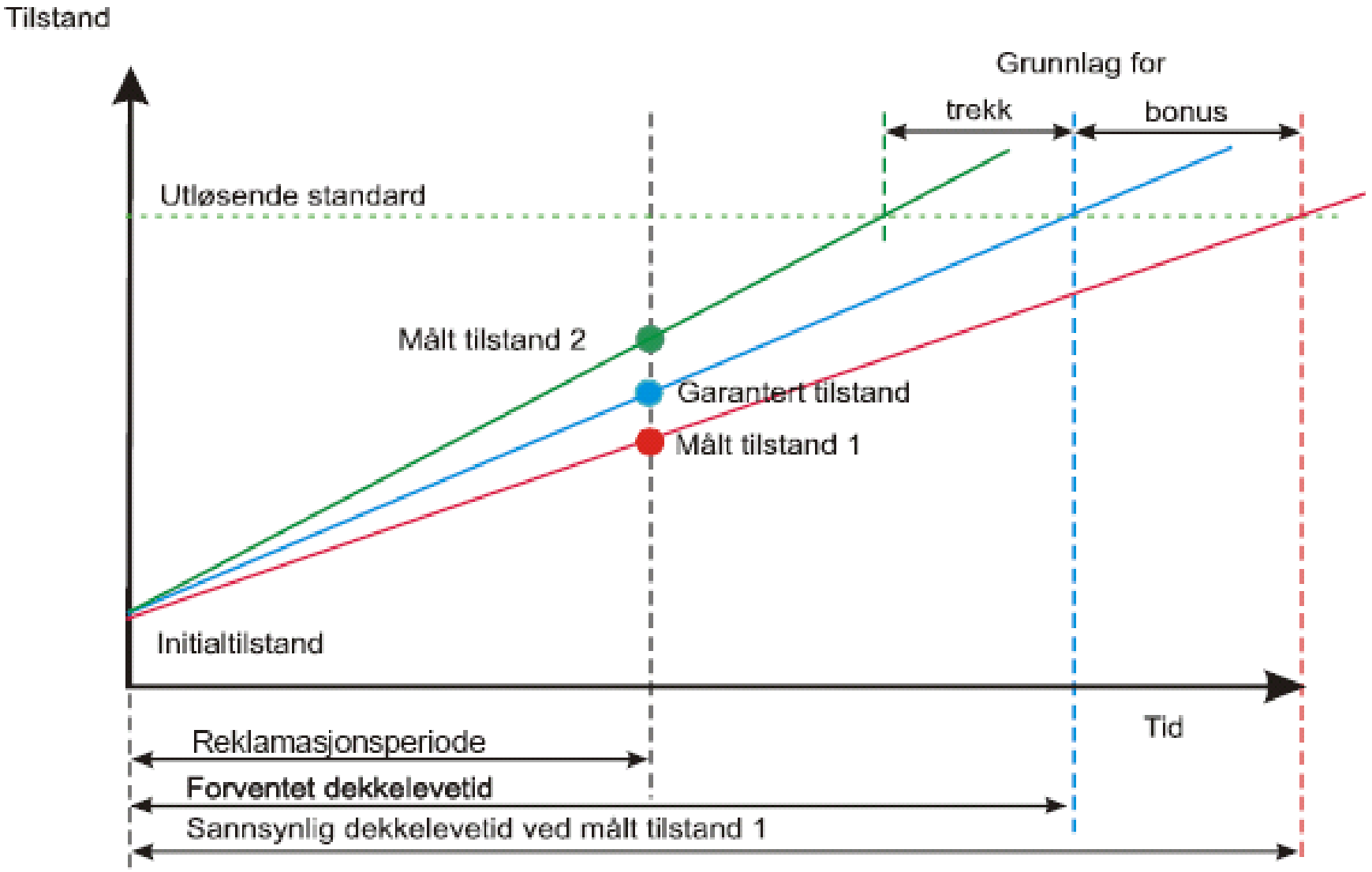
Performance based contracts today – low volume roads

- The perfomance based contracts on low volume roads are under development
  - The Strynefjell contract is the first contract on a low volume road
- Performance based performance indicators
  - **Initial rutting and IRI are the main parameters**
  - Friction
  - Crossfall
  - Holes and damages of the pavement
- The contractor decides methods
- Good results are rewarded the first year

Performance based contracts today – high volume roads

- Performance based indicators
  - **Development in rutting is the main parameter**, determining the pavement service life
  - Initial roughness measured by IRI
  - Friction
  - Crossfall
  - Holes and damages of the pavement
- The contractor decides both asphalt type/quality and methods
- The contractor needs to take most of the risk into account
  - Wear from studded tyres
  - Deformation in the asphalt pavement
  - Deformation in the underlying materials
    - Base, subbase and subgrade

Service life



Rutting – the key parameter

Causes of rutting in pavements

- Wear from studded tires
- Deformation
  - In the asphalt pavement
  - In a granular base, subbase or subgrade
- Initial rutting influences the total service life
  - A high degree of compaction is important
  - Surface temperature is important in combination with the cooling time available

Causes of variation in rutting

- Inhomogeneity (Contractor)
  - Separation in the asphalt mass
  - Variation in void content (compaction, temperature etc)
- Variations in lane width (Road owner)
- Curvature, obstacles etc (Road owner)

The ”perfect” perfomance based contract

Risk

Predictability

Bonus systems

Risk

- **Risk costs!** Today most of the risk is placed on the contractor
- How can the risk be reduced?
  - **Distribution of risk** between NPRA and contractor
  - **More available information** reduces the risk for the contractor
  - Some kind of **Prequalification** with trial sections may reduce the risk for both the contractor and NPRA
  - **Good correlation** between laboratory results and rutting in situ reduces the risk for the contractor
  - **Collaboration** in research projects and other projects to get more knowledge about the service life of pavements

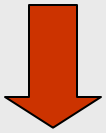
Distribution of risk NPRA/contractor

- The contractor is responsible for the parameters that the contractor has an influence on:
  - Quality (resistance against rutting)
  - Homogeneity (the same properties in the whole section)

- The contractor is responible for the development of rutting in selected sections
  - Suspected inhomogeneity in the pavement may be controlled by sampling

Distribution of risk NPRA/contractor

- The road owner (NPRA) needs to be responsible for variation in rutting caused by:
  - Narrowing lanes
  - Curvature
  - Rutting caused by some kind of obstacle
- The road owner (NPRA) has access to historical data from national database
  - This is the best basis for an evaluation of the risk connected to these parameters



- It is also possible to say something about the effect of road geometry on service life costs from these data

Distribution of risk NPRA/contractor

- Risk caused by changes in climate, traffic, studded tyres should be shared between the road owner and contractor
- Risk caused by changes in measuring methods should be placed on the road owner

More available information

- All possible information about the section should be available
  - Historical data on rutting, measured minimum two times per year – to split rutting caused by studded tyres from rutting caused by deformation
  - Historical data on pavement types, thicknesses
  - Current data on rut depth, IRI, friction, crossfall
  - Measurements of variation in bearing capacity over the year
  - Data on AADT, traffic growth, the number of heavy vehcles, amount of vehicles with studded tyres, the use of salt, climatic data etc.
- The data should be available for a longer period of time than today for the contractors to really process the data

Pre qualification?

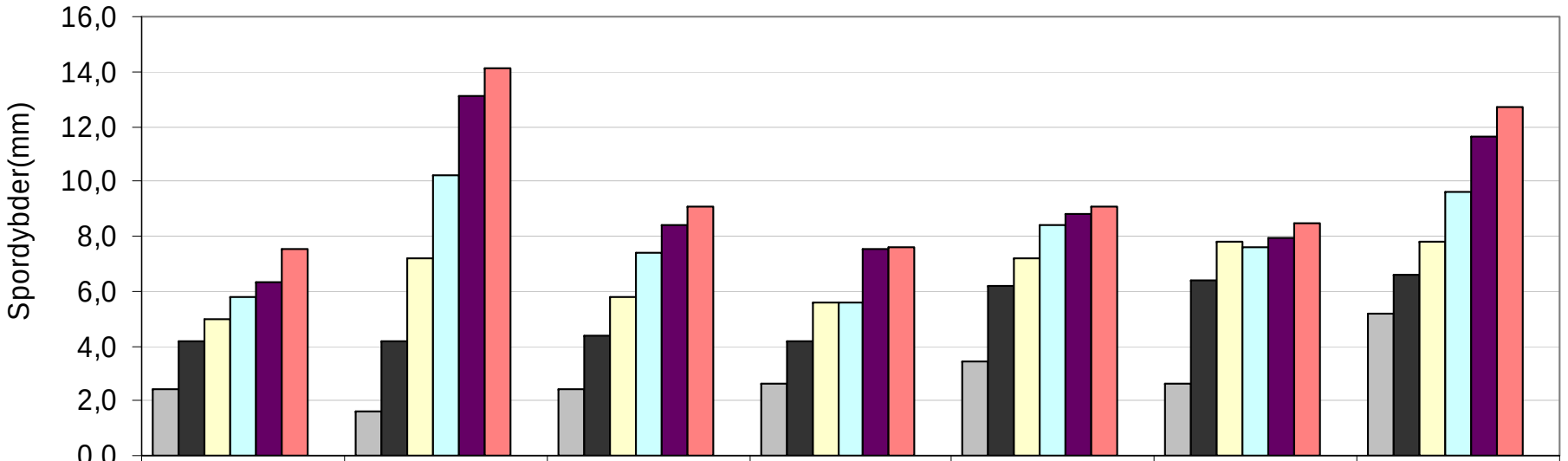
- One option is to have some kind of pre-qualification
  - All interested contractors should make their asphalt solution in trial sections
  - The two best alternatives are pre-qualified, and the best price combined with the best service life based on the results from the trial sections should do the job

Correlation between laboratory results and in situ conditions

- Properties measured in situ
  - Rut depth
  - Roughness
  - Bearing capacity
  - Friction
  - Etc.
- Properties measured in the laboratory
  - Bitumen (PG-class, viscosity, elastisity etc)
  - Aggregates (Ball Mill, Los Angeles etc)
  - Asphalt mass (Wheel Track, Cyclic creep etc)
- With good correlations between laboratory results and in situ rutting it is easier to predict the development of rutting

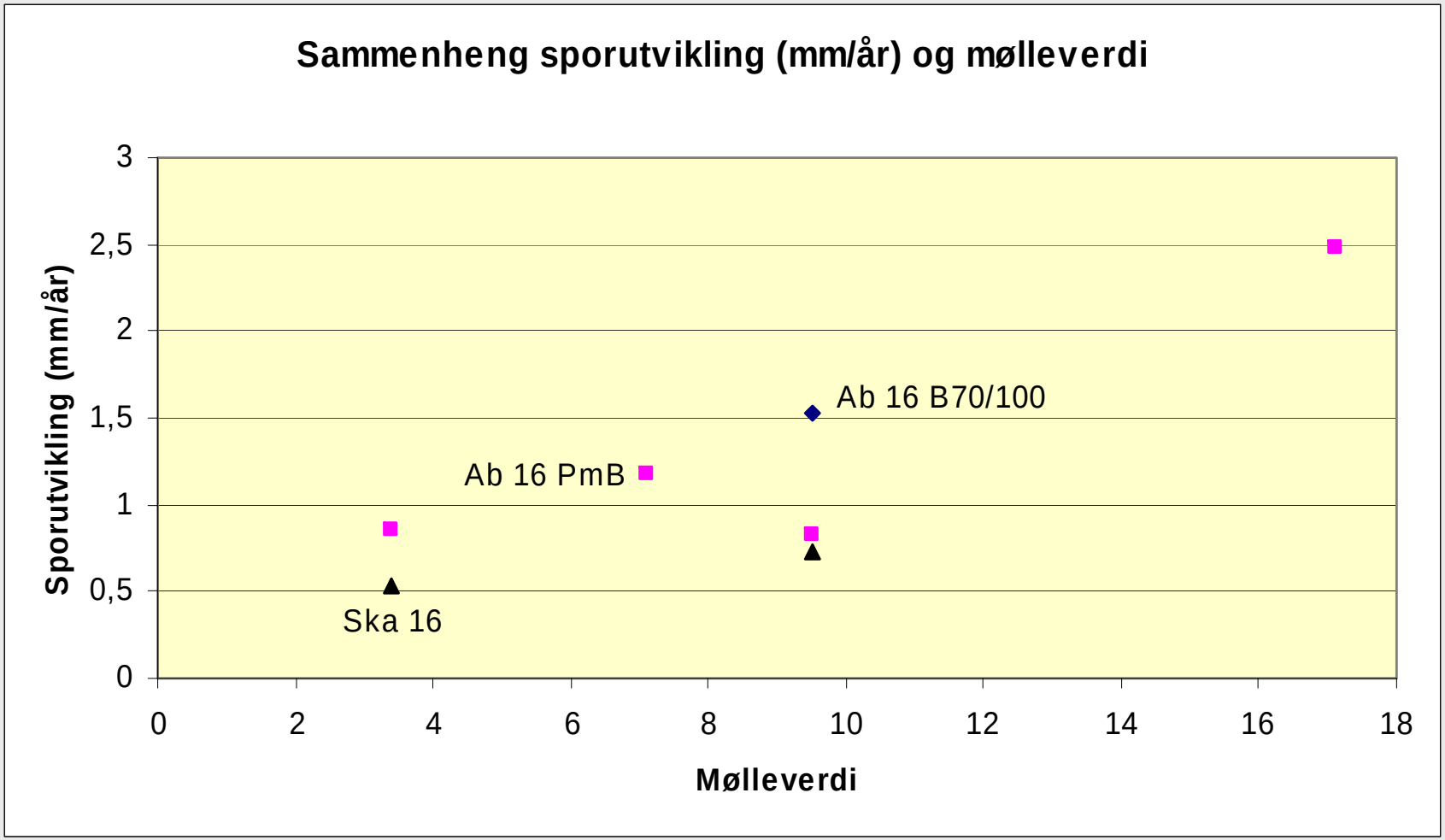
The SIV-project
Trial section E18 Vestfold

Rut depth measured by ALFRED, E18 Vestfold

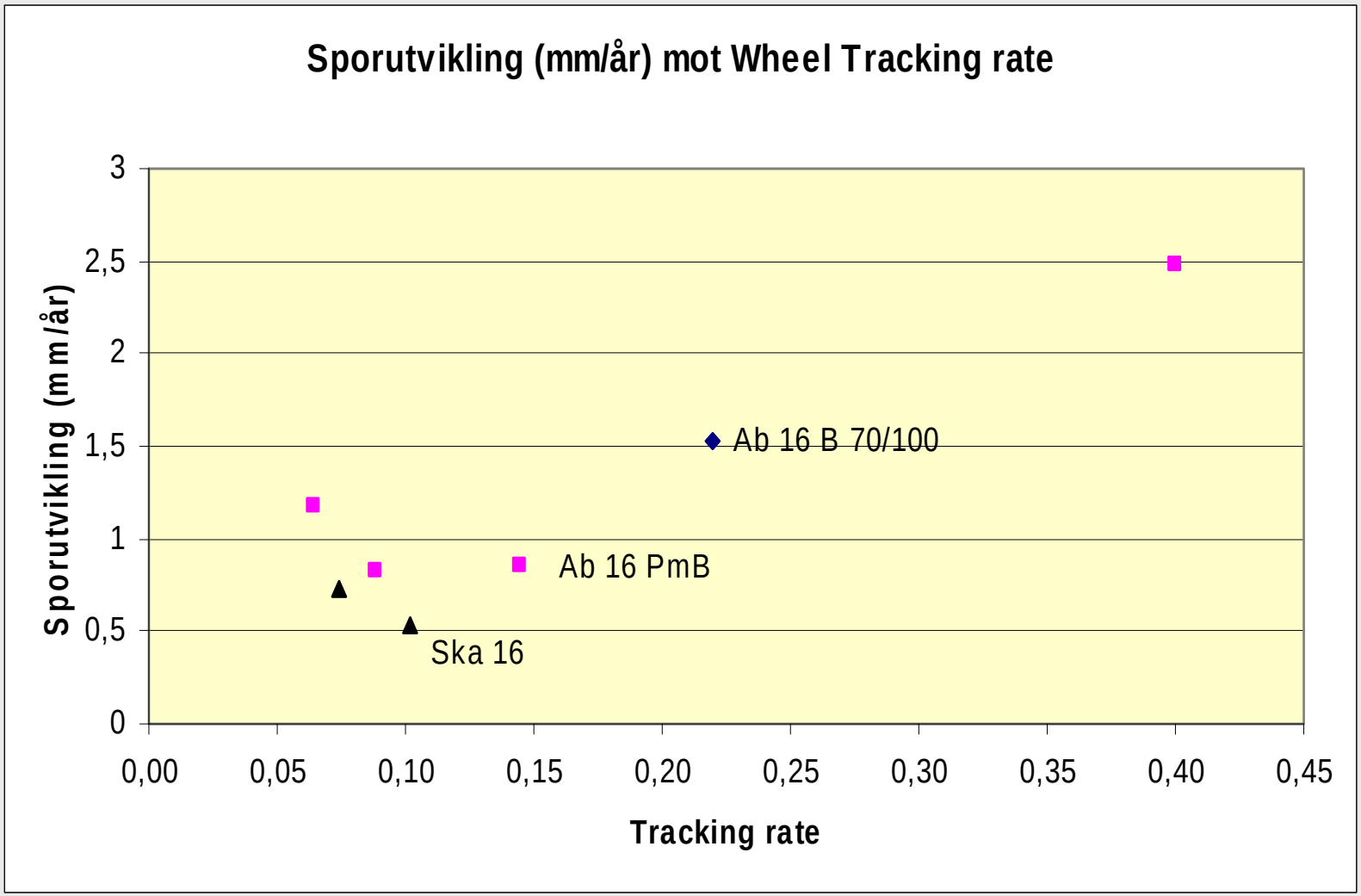


	Ab 16 PmB 60 Lierskogen	Ab 16 PmB 60 Hedrum	Ab 16 PmB 60 Hanekleiva	Ab 16 PmB 60 Hadeland	Ska 16 B70/100 Lierskogen	Ska 16 B70/100 Hadeland	Ab 16 B70/100 Lierskogen
2001	2,4	1,6	2,4	2,6	3,4	2,6	5,2
2002	4,2	4,2	4,4	4,2	6,2	6,4	6,6
2003	5,0	7,2	5,8	5,6	7,2	7,8	7,8
2004	5,8	10,2	7,4	5,6	8,4	7,6	9,6
2005	6,3	13,1	8,4	7,5	8,8	7,9	11,6
2006	7,5	14,1	9,1	7,6	9,1	8,5	12,7
2007							

Aggregate quality vs rutting

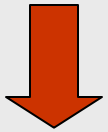


Wheel-track vs rutting



Predictability

- In order to meet the technical challenges the performance based contracts give, the contractors needs to invest in
  - Highly competent personell
  - Advanced equipment
  - Research and development of new technology
    - Methods, materials



- There is a need for a **high level of predictability** for the contractors to make these investments

Bonus-system

- Today, on high-volume roads the contractor is rewarded after a warranty period
- The Strynefjell-contract has a different bonus-system, where the initial rutting and IRI is rewarded
- A bonus-system with **both an initial bonus, and a bonus after a warranty period** may be a solution

The ”perfect” performance based contract – how should it be?

- Risk costs, this means that minimized risk is a win-win situation
- All data about the current pavement and the pavement history should be available to the contractor
- The road owner shoud take the risk of deformation in the base, subbase and subgrade
  - If the contractor should be resonsible for the whole road structure, measurements of bearing capacity should be availble
- One possibility is to have some kind of pre-qualification to get this kind of job – reduced risk for both the road owner and contractor
- One should find good correlation between laboratory results and real rutting in situ
  - Collaboration between the road owner and the contractor?

The ”perfect” performance based contract – how should it be?

- The ”perfect” contract has high level of predictability
- A bonus system with both an initial bonus and a bonus after a warranty period is favorable
- Performance based contracts gives incentives for development of new and better asphalt masses and methods
- Performance based contracts should be a win-win situation for both the road owner and the contractor
  - A long service life should be rewarded